STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No.	MO-0004812
Owner:	Ameren
Address:	P.O. Box 66149, MC-602, St. Louis, MO 63166-6149
Continuing Authority:	Same as above
Address:	Same as above
Facility Name:	Ameren Missouri-Labadie Energy Center
Facility Address:	226 Labadie Power Plant Road, Labadie, MO 63055
Legal Description:	See Pages Two and Three (2-3)
UTM Coordinates:	See Pages Two and Three (2-3)
Receiving Stream:	See Pages Two and Three (2-3)
First Classified Stream and ID:	See Pages Two and Three (2-3)
USGS Basin & Sub-watershed No.:	10300200-0603

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

See Page 2 for facility description. Ameren Missouri - Labadie Energy Center is a steam electrical power generation plant primarily engaged in the generation of electricity for distribution and sale. The plant consists of four generating units with a net capability of 2,407 megawatts (MW). The typical annual generation capacity is between eighteen and nineteen million megawatt hours (18,000,000-19,000,000 MWHR). This facility has eleven (12) permitted features.

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 621.250 RSMo, Section 640.013 RSMo and Section 644.051.6 of the Law.

August 1, 2015 — Effective Date
May 3, 2017 — Modification Date

Steven Feeler, Acting Director, Division of Environmental Quality

July 31, 2020 — Expiration Date

David J. Lamb, Acting Director, Water Protection Program

FACILITY DESCRIPTION (continued)

Outfall #001 - Steam Electric Power Plant - SIC #4911
Non-contact cooling water. In winter time, water can be routed back to intake structure to act as a warming line to prevent icing over.
Legal Description: NW ¼, NE ¼, Sec.18, T44N, R02E, Franklin County
UTM Coordinates: x = 688556; y = 4270810
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is 1,428 MGD. Actual flow is 941 MGD.

Outfall #002 - Steam Electric Power Plant - SIC #4911
Ash ponds, receiving flows from the bottom ash pond, fly ash pond, coal pile, coal pile runoff, sewage treatment plant. Treatment includes carbon dioxide (CO_2) injection for pH adjustment, settling, precipitation.
Legal Description: SE ¼, SW ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688017; y = 4269440
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is 57.8 MGD. Actual flow is 15.8 MGD.
Outfall #02A – Steam Electric Power Plant - SIC #4911
Internal monitoring point, discharge is through Outfall 002.
Domestic Wastewater: Extended aeration/sludge holding tank/sludge removed by contract hauler.
Legal Description: SW ¼, NE ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x =688649; y = 4270339
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is 0.05 MGD. Actual flow is 0.015 MGD.
Design sludge production is 0.85 dry tons per year; actual sludge production is 0.85 dry tons per year.

Outfall #003 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains a total of 5 acres, with 3.8 acres impervious surface.
Legal Description: NW ¼, NE ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688455; y = 4270696
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.

Outfall #004 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains 1.4 acres, all of which is impervious surface.
Legal Description: NE ¼, NW ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688328; y = 4270632
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.

Outfall #005 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains 0.1 acres, with 0.05 acres impervious surface.
Legal Description: NE ¼, NW ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688238; y = 4270565
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.

FACILITY DESCRIPTION (continued)

Outfall #006 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains 3.7 acres, with 1.8 acres impervious surface.
Legal Description: SE ¼, NW ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688058; y = 4270382
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.

Outfall #007 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains 3.3 acres, with 1.7 acres impervious surface.
Legal Description: SW ¼, NE ¼, Sec. 19, T44N, R02E, Franklin County
UTM Coordinates: x = 688331; y = 4268849
Receiving Stream: Tributary to Labadie Creek
First Classified Stream and ID: Labadie Creek (P) (1693)
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.

Outfall #008 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains 1.0 acres, with 0.5 acres impervious surface.
Legal Description: Landgrant 01921, Franklin County
UTM Coordinates: x = 688140; y = 4268511
Receiving Stream: Tributary to Labadie Creek
First Classified Stream and ID: Labadie Creek (P) (1693)
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.

Outfall #009 - Steam Electric Power Plant - SIC #4911
Ash Pond Emergency Spillway.
Legal Description: SE ¼, SW ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688017; y = 4269440
Receiving Stream: Tributary to Labadie Creek
First Classified Stream and ID: Labadie Creek (P) (1693)
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is 85.37 MGD.

Permitted Feature #010- Steam Electric Power Plant - SIC #4911
Intake Structure
Legal Description: NW ¼, NE ¼, Sec.18, T44N, R02E, Franklin County
UTM Coordinates: x = 688556; y = 4270810
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)

Outfall #011 - Steam Electric Power Plant - SIC #4911
Stormwater discharge. This outfall drains 18.85 acres, with 10 acres impervious surface.
Legal Description: NW ¼, NW ¼, Sec. 18, T44N, R02E, Franklin County
UTM Coordinates: x = 688578; y = 4270838
Receiving Stream: Missouri River (P)
First Classified Stream and ID: Missouri River (P) (1604) (303(d))
USGS Basin & Sub-watershed No.: (10300200-0603)
Design flow is N/A. Actual flow is dependent upon rainfall.
Estimated 10 Year 24 Hour Event: 29.8 MGD

Outfall #001 (Notes 2-6)

TABLE A-1.
INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective on **May 3, 2017**, and remain in effect through **July 31, 2020**, except for days described in Note 6 below. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	INTERIM EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Effluent Flow (Qe)	cfs	*		*	daily	calculated
Effluent Temperature (Te)	°F	*		*	daily	measured
Stream Flow (Qs)	cfs	*		*	daily	measured
Stream Temperature (Ts)	°F	*		*	daily	measured
Thermal Discharge Parameter (TDP)		0.95		0.95	daily	calculated
Mixing Zone (As Percent of Total River Flow)	%	*		*	daily	calculated
MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE JUNE 28, 2017.						
Whole Effluent Toxicity (WET) test (Note 1)	TUc	*			Unscheduled	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE SEPTEMBER 28, 2017.						

Outfall #001 (Notes 2-6)

TABLE A-2.
FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective on **August 1, 2020**. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Effluent Flow (Qe)	cfs	*		*	daily	calculated
Effluent Temperature (Te)	°F	*		*	daily	measured
Stream Flow (Qs)	cfs	*		*	daily	measured
Stream Temperature (Ts)	°F	*		*	daily	measured
Thermal Discharge Parameter (TDP)		0.95		0.95	daily	calculated
Mixing Zone (As Percent of Total River Flow)	%	*		*	daily	calculated
MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE SEPTEMBER 28, 2020.						
Whole Effluent Toxicity (WET) test (Note 1)	TUc	*			Unscheduled	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE SEPTEMBER 28, 2020.						

* Monitoring requirement only.

Note 1: Outfall #001 is not required to conduct regularly scheduled Whole Effluent Toxicity (WET) Testing. However, in the event that the permittee determines they must use a molluscicide or other toxic pollutants to remove organisms from intake structures, WET testing shall be conducted once per year as described in the terms and conditions for WET testing for Outfall #001, which is contained in Special Condition #17, on page 12 of 13 of this operating permit.

Note 2: Stream flow is measured in cubic feet per second (cfs) of the receiving stream. The permittee shall obtain stream flow data from USGS Gage Station 06935550 near Labadie, MO.

Note 3: Stream temperature is measured in degrees Fahrenheit (°F) of the receiving stream. The permittee shall obtain stream temperature data from USGS Gage Station 06935550 near Labadie, MO.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

Note 4: Thermal Discharge Parameter (TDP) is a derivation from site-specific model solutions of the thermal plume created by the discharge from Outfall #001 into the Missouri River. Thermal Discharge Parameter represents a combination of stream flow, stream temperature, effluent flow, and effluent temperature, as defined by the equations below, in which the mixing zone is less than 25% of the receiving flow. The numeric effluent limitation, 0.95, incorporates an additional five percent margin of safety to ensure compliance with the water quality standards for temperature, maximum of 90°F and maximum change of 5°F, at the edge of the thermal mixing zone. Additional requirements are found in Special Condition #19. TDP shall be calculated using the following equations:

When $Ts < 80°F$:

$$M2 = 0.00005275 (Te - Ts)^2 - 0.00544551 (Te - Ts) + 0.19336524$$

When $80°F \leq Ts \leq 85°F$:

$$M2 = 0.00005275 (Te - Ts)^2 - 0.00544551 (Te - Ts) + (-0.000200\ Ts + 0.209365)$$

When $85°F < Ts < 90°F$:

$$M2 = (-0.00001055 * Ts + 0.00094950) (Te - Ts)^2 - (-0.00108910 * Ts + 0.09801913) (Te - Ts) + (-0.03847303 * Ts + 3.46257232)$$

For all equations, when the difference between effluent temperature (Te) and stream temperature (Ts) is less than 25°F, (Te – Ts) shall be set to 25°F. The difference between effluent temperature (Te) and stream temperature (Ts) shall not exceed 50°F.

Qe = Effluent flow from Outfall #001 in cfs.
Te = Effluent temperature from Outfall #001 in °F.
Qs = Stream flow minus intake flow in cfs.
Ts = Stream temperature in °F.
M1 = (Qe / (Qs + Qe))
TDP= (M1 / M2)

Note 5: Mixing Zone (As Percent of Total River Flow) shall be calculated using the following equation:

$$\text{Mixing Zone} = [\ 0.1857 \ln (M1 / M2) + 0.234] * 100$$

Note 6: During the schedule of compliance the interim effluent limitation for TDP shall not be applicable on days when: 1) Stream temperature is greater than or equal to 87 °F; or 2) Stream flow is less than or equal to 24,000 cfs. On days when one or both of these conditions are met the daily maximum, interim effluent limitation for Outfall #001 shall be 11.16×10^9 BTUs/hr, calculated daily using thermodynamic equations based on generation from all four units.

Stream temperature and flow shall be measure in accordance with Note 2 & Note 3.

Outfall #02A

TABLE A-3.
INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective upon issuance and remain in effect until **July 30, 2017**. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	INTERIM EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	once/quarter***	24 hr. estimate
Biochemical Oxygen Demand$_5$	mg/L	45		30	once/quarter***	grab
Total Suspended Solids	mg/L	45		30	once/quarter***	grab
pH	SU	**		**	once/quarter***	grab
Ammonia as N	mg/L	*		*	once/quarter***	grab
Oil and grease	mg/L	15		10	once/quarter***	grab
E. Coli	#/100mL	*		*	once/quarter***	grab

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE OCTOBER 28, 2015.

Outfall #02A

TABLE A-4.
INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective **August 1, 2017**, and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	once/quarter***	24 hr. estimate
Biochemical Oxygen Demand$_5$	mg/L	45		30	once/quarter***	grab
Total Suspended Solids	mg/L	45		30	once/quarter***	grab
pH	SU	**		**	once/quarter***	grab
Ammonia as N	mg/L	*		*	once/quarter***	grab
Oil and grease	mg/L	15		10	once/quarter***	grab
E. Coli (Note 7)	#/100mL	1030		206	once/quarter***	grab

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE OCTOBER 28, 2017. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.

* Monitoring requirement only.

** pH is measured in pH units and is not to be averaged. The pH is limited to the range of 6.0-9.0 pH units.

*** See table below for quarterly sampling

Sample discharge at least once for the months of:	Report is due:
January, February, March (1st Quarter)	April 28
April, May, June (2nd Quarter)	July 28
July, August, September (3rd Quarter)	October 28
October, November, December (4th Quarter)	January 28

Note7: Final limitations and monitoring requirements for *E. Coli* are applicable only during the recreational season from April 1 through October 31. The Monthly Average Limit for *E. Coli* is expressed as a geometric mean.

TABLE A-5.
EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfall #002 (Note 8)						
Flow	MGD	*		*	once/week	24 hr. total
Total Suspended Solids (Gross)	mg/L	*		*	once/week	grab
Total Suspended Solids (Net)	mg/L	100		30	once/week	calculated
pH	SU	**		**	once/week	grab
Oil and grease	mg/L	15		10	once/month	grab
MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE SEPTEMBER 28, 2015.						
Chemical Oxygen Demand	mg/L	*		*	once/quarter***	grab
Sulfate as SO_4	mg/L	*		*	once/quarter***	grab
Chloride	mg/L	*		*	once/quarter***	grab
Boron, Total Recoverable	µg/L	*		*	once/quarter***	grab
Total Phosphorus	mg/L	*		*	once/quarter***	grab
Total Nitrogen	mg/L	*		*	once/quarter***	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE SEPTEMBER 28, 2015.						
Whole Effluent Toxicity (WET) test (Note 9)	TUc	*			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE SEPTEMBER 28, 2015. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.						
Outfall #009 (Notes 8 & 10)						
Flow	MGD	*		*	once/discharge	24 hr. estimate
Chemical Oxygen Demand	mg/L	*		*	once/discharge	grab
Total Suspended Solids (Gross)	mg/L	*		*	once/discharge	grab
Total Suspended Solids (Net)	mg/L	100		30	once/discharge	calculated
pH	SU	**		**	once/discharge	grab
Oil and grease	mg/L	15		10	once/discharge	grab
Sulfate as SO_4	mg/L	*		*	once/discharge	grab
Chloride	mg/L	*		*	once/discharge	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE OCTOBER 28, 2015. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.						
Permitted Feature #010						
Intake flow	cfs	*		*	daily	measured
Total Suspended Solids (intake)	mg/L	*		*	once/week	calculated
Hardness as $CaCO_3$	mg/L	*		*	once/month	grab
MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE JUNE 28, 2017. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.						

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

* Monitoring requirement only.

** pH is measured in pH units and is not to be averaged. The pH is limited to the range of 6.0-9.0 pH units.

*** See table below for quarterly sampling

Sample discharge at least once for the months of:		Report is due:
January, February, March	(1st Quarter)	April 28
April, May, June	(2nd Quarter)	July 28
July, August, September	(3rd Quarter)	October 28
October, November, December	(4th Quarter)	January 28

Note 8: Effluent limitations for TSS for Outfalls #002 and #009 are net limits. Credit for TSS in the intake water is authorized and subject to the following:

(a) Only water withdrawn from the Missouri River that is used for process water (e.g., fly ash transport) and subsequently discharged to the Missouri River shall be used in calculating the net discharge limit for Total Suspended Solids. Credit for Total Suspended Solids from other sources of water (e.g., rainwater) shall not be used for credit. Ameren Labadie has developed a water balance in calculating their net discharge based on intake from the Missouri river and not including the any other inputs from the site.

(b) Credit shall be granted only to the extent necessary to meet the Total Suspended Solids limit.

(c) The maximum credit shall not exceed the concentration of Total Suspended Solids in the intake water after any treatment of the intake water.

(d) All measures for flow and Total Suspended Solids must be made on the same day.

(e) Net discharge is to be calculated as follows:

$$[(Q_d \times 8.34 \times C_d) - (Q_r \times 8.34 \times C_r)] / (Q_d \times 8.34) = \text{TSS Net in mg/L}$$

Where:

Q_d = Flow from Outfall #002 or #009 (in MGD).
C_d = Concentration in TSS measure in the final effluent from Outfall #002 or #009 (in mg/L);
Q_r = Intake flow (in MGD) that flows to either Outfall #002 or #009
C_r = Intake flow TSS concentration (in mg/L).

Note 9: Outfall #002 is required to conduct regularly scheduled Whole Effluent Toxicity (WET) Testing. WET testing shall be conducted once per year as described in the terms and conditions for WET testing for Outfall #002, which is contained in Special Condition #20, on page 14 of this operating permit.

Note 10: Sampling at Outfall #009 is required once per day in the event that a discharge occurs. When no discharge occurs, report as 'No Discharge'.

TABLE A-6.
EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	**FINAL EFFLUENT LIMITATIONS**		BENCH-MARKS	MONITORING REQUIREMENTS	
		DAILY MAXIMUM	MONTHLY AVERAGE		MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfall #003-006 & 011						
Flow	MGD	*		*	once/quarter***	24 hr. estimate
Precipitation	Inches	*		*	once/quarter***	measured
Chemical Oxygen Demand	mg/L	**		90	once/quarter***	grab∞
Oil & Grease	mg/L	**		10	once/quarter***	grab∞
pH (Note 11)	SU	**		6.5 - 9.0	once/quarter***	grab∞
Settleable Solids	mL/L/hr	**		1.5	once/quarter***	grab∞

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE JULY 28, 2017. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.

* Monitoring requirement only.

** Monitoring requirement with associated benchmark. See Special Conditions #11 through #14.

*** See table below for quarterly sampling

∞ All samples shall be collected from a discharge resulting from a precipitation event greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable precipitation event. If a discharge does not occur within the reporting period, report as no discharge. The total amount of precipitation should be noted from the event from which the samples were collected.

Sample discharge at least once for the months of:		Report is due:
January, February, March	(1st Quarter)	April 28
April, May, June	(2nd Quarter)	July 28
July, August, September	(3rd Quarter)	October 28
October, November, December	(4th Quarter)	January 28

Note 11: The facility will report the minimum and maximum values. pH is not to be averaged.

B. STANDARD CONDITIONS

In addition to specified conditions stated herein, this permit is subject to the attached Part I standard conditions dated August 1, 2014, and hereby incorporated as though fully set forth herein.

C. SPECIAL CONDITIONS

1. This permit may be reopened and modified, or alternatively revoked and reissued, to:
   (a) Comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
      (1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
      (2) controls any pollutant not limited in the permit.
   (b) Incorporate new or modified effluent limitations or other conditions, if the result of a waste load allocation study, toxicity test or other information indicates changes are necessary to assure compliance with Missouri's Water Quality Standards.
   (c) Incorporate new or modified effluent limitations or other conditions if, as the result of a watershed analysis, a Total Maximum Daily Load (TMDL) limitation is developed for the receiving waters which are currently included in Missouri's list of waters of the state not fully achieving the state's water quality standards, also called the 303(d) list.

   The permit as modified or reissued under this paragraph shall also contain any other requirements of the Clean Water Act then applicable.

2. All outfalls must be clearly marked in the field.

3. Water Quality Standards
   (a) To the extent required by law, discharges to waters of the state shall not cause a violation of water quality standards rule under 10 CSR 20-7.031, including both specific and general criteria.
   (b) General Criteria. The following general water quality criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:
      (1) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
      (2) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
      (3) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
      (4) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life;
      (5) There shall be no significant human health hazard from incidental contact with the water;
      (6) There shall be no acute toxicity to livestock or wildlife watering;
      (7) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community;
      (8) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247.Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day.

4. 40 CFR 125.98(b)(1): "Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act."

C. SPECIAL CONDITIONS (continued)

5. Changes in Discharges of Toxic Pollutant

In addition to the reporting requirements under §122.41(1), all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

(a) That an activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:
   (1) One hundred micrograms per liter (100 µg/L);
   (2) Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile;
   (3) Five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol;
   (4) One milligram per liter (1 mg/L) for antimony;
   (5) Five (5) times the maximum concentration value reported for the pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or
   (6) The notification level established by the department in accordance with 40 CFR 122.44(f).

(b) That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
   (1) Five hundred micrograms per liter (500 µg/l);
   (2) One milligram per liter (1 mg/l) for antimony;
   (3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with §122.21(g)(7).
   (4) The level established by the Director in accordance with §122.44(f).

6. Report as no-discharge when a discharge does not occur during the report period.

7. Electronic Discharge Monitoring Report (eDMR) Submission System.

(a) Discharge Monitoring Reporting Requirements. The permittee must electronically submit compliance monitoring data via the eDMR system. In regards to Standard Conditions Part I, Section B, #7, the eDMR system is currently the only Department approved reporting method for this permit.

(b) Programmatic Reporting Requirements. The following reports (if required by this permit) must be electronically submitted as an attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:
   (1) Schedule of Compliance Progress Reports;
   (2) CWA Section 316(b) Annual Reports; and
   (3) Any additional report required by the permit excluding bypass reporting.

   After such a system has been made available by the department, required data shall be directly input into the system by the next report due date.

(c) Other actions. The following shall be submitted electronically after such a system has been made available by the department:
   (1) General Permit Applications/Notices of Intent to discharge (NOIs);
   (2) Notices of Termination (NOTs);
   (3) No Exposure Certifications (NOEs);

(d) Electronic Submissions. To access the eDMR system, use the following link in your web browser: [HYPERLINK "https://edmr.dnr.mo.gov/edmr/E2/Shared/Pages/Main/Login.aspx"].

(e) Waivers from Electronic Reporting. The permittee must electronically submit compliance monitoring data and reports unless a waiver is granted by the department in compliance with 40 CFR Part 127. The permittee may obtain an electronic reporting waiver by first submitting an eDMR Waiver Request Form: [HYPERLINK "http://dnr.mo.gov/forms/780-2692-f.pdf"]. The department will either approve or deny this electronic reporting waiver request within 120 calendar days. Only permittees with an approved waiver request may submit monitoring data and reports on paper to the Department for the period that the approved electronic reporting waiver is effective.

C. SPECIAL CONDITIONS (continued)

8. Reporting of Non-Detects
   (a) An analysis conducted by the permittee or their contracted laboratory shall be conducted in such a way that the precision and accuracy of the analyzed result can be enumerated.
   (b) The permittee shall not report a sample result as "Non-Detect" without also reporting the detection limit of the test. Reporting as "Non-Detect" without also including the detection limit will be considered failure to report, which is a violation of this permit.
   (c) The permittee shall report the "Non-Detect" result using the less than sign and the minimum detection limit (e.g. <10).
   (d) Where the permit contains a Minimum Level (ML) and the permittee is granted authority in the permit to report zero in lieu of the < ML for a specified parameter (conventional, priority pollutants, metals, etc.), then zero (0) is to be reported for that parameter.
   (e) See Standard Conditions Part I, Section A, #4 regarding proper detection limits used for sample analysis.
   (f) When calculating monthly averages, one-half of the minimum detection limit (MDL) should be used instead of a zero. Where all data are below the MDL, the "<MDL" shall be reported as indicated in item (C).

9. It is a violation of the Missouri Clean Water Law to fail to pay fees associated with this permit (644.055 RSMo).

10. There shall be no discharge of polychlorinated biphenyl (PCB) compounds such as those commonly used for transformer fluid.

11. The department may also require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or evidence of off-site impacts from activities from this facility. If such an action is needed, the department will specify in writing the sampling requirement, including such information as location and extent. It is a violation of this permit to fail to comply with said written notification to sample.

12. Substances, regulated by federal law under the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), that are transported, stored, or used for maintenance, cleaning or repair, shall be managed according to RCRA and CERCLA. The permittee is exempt from Clean Water Act, Section 311, reporting for sulfuric acid and sodium hydroxide as per 40 CFR 117.12.

13. The permittee shall develop and implement the Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must be kept on-site and should not be sent to DNR unless specifically requested. The permittee shall select, install, use, operate, and maintain the Best Management Practices prescribed in the SWPPP in accordance with the concepts and methods described in the following document: Developing Your Stormwater Pollution Prevention Plan, A Guide for Industrial Operators, (Document number EPA 833-B-09-002) published by the United States Environmental Protection Agency (USEPA) in February 2009.

    The SWPPP must include the following (continued):
    (a) A listing of specific Best Management Practices (BMPs) and a narrative explaining how BMPs will be implemented to control and minimize the amount of potential contaminants that may enter storm water. Minimum BMPs are listed below.
    (b) The SWPPP must include a schedule for quarterly site inspections and a brief written report. The inspections must include observation and evaluation of BMP effectiveness, deficiencies, and corrective measures that will be taken. The department must be notified within fifteen (15) days by letter of any corrections of deficiencies. Deficiencies that consist of minor repairs or maintenance must be corrected within seven (7) days. Deficiencies that require additional time or installation of a treatment device to correct should be detailed in the written notification. Installation of a treatment device, such as an oil water separator, may require a construction permit. Inspection reports must be kept on site with the SWPPP. These must be made available to DNR personnel upon request.
    (c) A provision for designating an individual to be responsible for environmental matters.
    (d) A provision for providing training to all personnel involved in material handling and storage, and housekeeping of maintenance and cleaning areas. Proof of training shall be submitted on request of DNR.

C. SPECIAL CONDITIONS (continued)

14. Permittee shall adhere to the following minimum Best Management Practices:
    (a) Prevent the spillage or loss of fluids, oil, grease, fuel, etc. from vehicle maintenance, equipment cleaning, or warehouse activities and thereby prevent the contamination of storm water from these substances.
    (b) Provide collection facilities and arrange for proper disposal of waste products including but not limited to petroleum waste products, and solvents.
    (c) Store all paint, solvents, petroleum products and petroleum waste products (except fuels), and storage containers (such as drums, cans, or cartons) so that these materials are not exposed to storm water or provide other prescribed BMP's such as plastic lids and/or portable spill pans to prevent the commingling of storm water with container contents. Commingled water may not be discharged under this permit. Provide spill prevention control, and/or management sufficient to prevent any spills of these pollutants from entering waters of the state. Any containment system used to implement this requirement shall be constructed of materials compatible with the substances contained and shall also prevent the contamination of groundwater.
    (d) Provide good housekeeping practices on the site to keep solid waste from entry into waters of the state.
    (e) Provide sediment and erosion control sufficient to prevent or control sediment loss off of the property.

15. Outfalls #003-#006 & 011: This permit stipulates pollutant benchmarks applicable to Labadie stormwater discharges. The benchmarks do not constitute direct numeric effluent limitations; therefore, a benchmark exceedance alone is not a permit violation. Benchmark monitoring and visual inspections shall be used to determine the overall effectiveness of SWPPP and to assist in knowing when additional corrective action may be necessary to protect water quality. If a sample exceeds a benchmark concentration you must review your SWPPP and your BMPs to determine what improvements or additional controls are needed to reduce that pollutant in your stormwater discharges.

    Any time a benchmark exceedance occurs a Corrective Action Report (CAR) must be completed. A CAR is a document that records the efforts undertaken by the facility to improve BMPs to meet benchmarks in future samples. CARs must be retained with the SWPPP and available to the department upon request. If the efforts taken by the facility are not sufficient and subsequent exceedances of a benchmark occur, the facility must contact the department if a benchmark value cannot be achieved. Failure to take corrective action to address a benchmark exceedance and failure to make measurable progress towards achieving the benchmarks is a permit violation.

16. To protect the general criteria found at 10 CSR 20-7.031(4), before releasing water accumulated in secondary containment areas, it must be examined for hydrocarbon odor and presence of sheen. If the presence of odor or sheen is indicated, the water shall be treated using an appropriate method or disposed of in accordance with legally approved methods, such as being sent to a wastewater treatment facility. Following treatment, the water shall be tested for oil and grease, benzene, toluene, ethylbenzene, and xylene using 40 CFR part 136 methods. All pollutant levels must be below the most protective, applicable standards for the receiving stream, found in 10 CSR 20-7.031 Table A. Records of all testing and treatment of water accumulated in secondary containment shall be stored in the SWPPP to be available on demand to DNR and EPA personnel.

17. Use and disposal of Coal Ash
    (a) Disposal of ash is not authorized by this permit.
    (b) This permit does not pertain to permits for disposal of ash or exemptions for beneficial use of ash under the Missouri Solid Waste Management Law and regulations, as established in 10 CSR 80.
    (c) The requirements below are separate and in addition to the requirements established under the Resource Conservation and Recovery Act in §40 CFR 257.
    (d) This permit does not authorize off-site storage, use or disposal of ash in regard to water pollution control permits required under 10 CSR 20-6.015 and 10 CSR 20-6.200.
    (e) The permittee shall install a groundwater monitoring system around the coal ash impoundments that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer. The monitoring system must be capable of accurately representing background water quality and the quality of groundwater passing the waste boundary of the impoundment. As soon as possible but no later than:
        (1) 6 months from the effective date of this permit, the permittee shall submit a Site Investigation Workplan to the Central Office for approval. The work plan must be developed in accordance with Guidance for Conducting a Detailed Hydrogeologic Site Characterization and Designing a Groundwater Monitoring Program issued by the Geological Survey Program, Environmental Geology Section, dated December 10, 2010.
        (2) 27 months from the effective date of this permit, the permittee shall submit a Site Characterization Report detailing the findings from completion of the Detailed Hydrogeologic Site Characterization.
        (3) 30 months from the effective date of 40 CFR 257, the permittee shall submit the results from eight statistically independent groundwater samples that accurately represent background water quality and the quality of groundwater pursuant to §40 CFR 257.93
        (4) 30 months from the effective date of this permit, the permittee shall submit a long-term Groundwater Monitoring & Sampling Plan (GMSAP) to the Central Office for approval. The plan must provide a detailed explanation of:

C. SPECIAL CONDITIONS (continued)

a. How the monitoring program will accurately represent upgradient and downgradient water quality, and
b. How the permittee will determine if there has been a statistically significant increase over background.

(5) 36 months from the effective date of this permit have all elements of the long-term GMSAP fully implemented.

(f) Data collected in accordance with the GMSAP shall be submitted to the department within 3 months of receipt of the results. Results shall be submitted electronically using forms provided by the department.

18. 316(b) Cooling Water Intake Structure

(a) The permittee is required to continue operating intake structures as indicated in the approved 1980 and subsequent 2007 impingement studies. Intakes shall be operated in a manner that minimizes impingement and entrainment until the permittee has submitted the application required in 40 CFR 122.21 and 40 CFR 125 Subpart J and best technology available is established in accordance with Clean Water Act 316(b) regulations. The promulgated 316(b) regulations require modifications to reduce impingement and entrainment caused by intake structures.

(b) The permittee shall follow the timetable in 40 CFR 122.21 and 40 CFR 125 Subpart J regulations regarding reduction in impingement and entrainment and their associated biomonitoring studies.

(c) The permittee shall submit annual status reports by February 28 each year, detailing the progress of the previous year.

(d) Six months prior to permit expiration, the permittee shall submit their application for 316(b) detailing the results of the biomonitoring studies and the selected path forward for implementing impingement and entrainment modifications at the intake structure.

(e) This permit may be reopened and modified, or alternatively revoked and reissued to: incorporate new or modified requirements applicable to existing cooling water intake structures under Section 316(b) of the Clean Water Act. In the event that, it is necessary for this permit to be reopened and modified, or alternatively revoked and reissued, permittee shall comply with any such new or modified requirements or standards applicable to existing cooling water intake structures under 316(b) of the Clean Water Act.

19. The permittee shall submit a monitoring plan for implementation when stream flow is less than 35,000 cubic feet per second or when stream temperature is greater than 85 degrees Fahrenheit, as measured at USGS Gage Station 06935550 near Labadie, MO. The plan shall include and provide for monitoring to characterize the thermal mixing zone throughout the river, downstream of the point where the thermal discharge channel enters the river. No two such monitoring events will be required within six months of each other. The requirement of this special condition shall remain in effect until 1) expiration of the permit or 2) until such time an alternate final thermal effluent limitation is established in accordance with applicable law. The results of sampling shall be reported to the department and compliance shall be determined against the water quality standards for temperature, maximum of 90°F and maximum change of 5°F, at the edge of the thermal mixing zone, except during the schedule of compliance when 1) Stream temperature is greater than or equal to 87 °F; or 2) Stream flow is less than or equal to 24,000 cfs.

In addition, for any day for which $0.95 < TDP \leq 1.0$, the permittee may conduct stream monitoring to determine compliance with the water quality standards, in accordance with a monitoring plan approved by the department. The results of sampling shall be reported to the department and compliance shall be determined against the water quality standards for temperature, maximum of 90°F and maximum change of 5°F, at the edge of the thermal mixing zone

(a) Within six months of the permit issuance date, the permittee shall submit for department review, monitoring plans which outline how the permittee will conduct water temperature monitoring.

C. SPECIAL CONDITIONS (continued)

20. Chronic Whole Effluent Toxicity (WET) tests shall be conducted as follows:

SUMMARY OF CHRONIC WET TESTING FOR THIS PERMIT					
OUTFALL	AEC	Chronic Toxic Unit (TU_c)	FREQUENCY	SAMPLE TYPE	MONTH
001	62%	*	unscheduled	grab	any
002	7%	*	once/year	grab	August

*Monitoring only

Outfall 001 Dilution Series						
100%	62%	25%	12.5%	6.25%	(Control) 100% upstream, if available	(Control) 100% Lab Water, also called synthetic water
Outfall 002 Dilution Series						
100%	50%	25%	7%	3.5%	(Control) 100% upstream, if available	(Control) 100% Lab Water, also called synthetic water

a) Freshwater Species and Test Methods

i. Species and short-term test methods for estimating the chronic toxicity of NPDES effluents are found in the fourth edition of *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA/821/R-02/013, 2002; Table IA, 40 CFR Part 136). The permittee shall concurrently conduct 7-day, static, renewal toxicity tests with the following vertebrate species:

- The fathead minnow, *Pimephales promelas* (Survival and Growth Test Method 1000.0).

And the following invertebrate species:

- The daphnid, *Ceriodaphnia dubia* (Survival and Reproduction Test Method 1002.0).

ii. Chemical and physical analysis of an upstream control sample and effluent sample shall occur immediately upon being received by the laboratory, prior to any manipulation of the effluent sample beyond preservation methods consistent with federal guidelines for WET testing that are required to stabilize the sample during shipping. Where upstream receiving water is not available, synthetic laboratory control water may be used.

iii. Test conditions must meet all test acceptability criteria required by the EPA Method used in the analysis.

iv. Any and all chemical or physical analysis of the effluent sample performed in conjunction with the WET test shall be performed at the 100% Effluent concentration in addition to analysis performed upon any other effluent concentration.

v. All chemical analyses shall be performed and results shall be recorded in the appropriate field of the report form. The parameters for chemical analysis include, but are not limited to Temperature (°C), pH (SU), Conductivity (µMohs), Dissolved Oxygen (mg/L), Un-ionized Ammonia (mg/L), Total Alkalinity (mg/L), Total Recoverable Boron (µg/L), Total Recoverable Molybdenum (µg/L), and Total Hardness (mg/L).

b) Reporting of Chronic Toxicity Monitoring Results

i. WET test results shall be submitted by eDMR, or with the permittee's Discharge Monitoring Reports by September 28, 2015. to the St. Louis Regional Office, The submittal shall include:
   1. A full laboratory report for all toxicity testing.
   2. Copies of chain-of-custody forms.
   3. The WET form provided by the department upon permit issuance.

ii. The report must include a quantification of chronic toxic units ($TU_c = 100/IC_{25}$) reported according to the *Methods for Measuring the Chronic Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* chapter on report preparation and test review. The 25 percent Inhibition Effect Concentration (IC_{25}) is the toxic or effluent concentration that would cause 25 percent reduction in mean young per female or in growth for the test populations.

c) Permit Reopener for Chronic Toxicity

In accordance with 40 CFR Parts 122 and 124, this permit may be modified to include effluent limitations or permit conditions to address chronic toxicity in the effluent or receiving waterbody, as a result of the discharge; or to implement new, revised, or newly interpreted water quality standards applicable to chronic toxicity.

D. SCHEDULE OF COMPLIANCE – Thermal Discharges

1. The permittee must attain compliance with the final thermal effluent limits as soon as possible, but no later than August 1, 2020, unless an alternate final thermal effluent limitation is established in accordance with applicable law.
2. During this permit cycle, the permittee shall evaluate engineering and operational controls to achieve compliance with the final thermal effluent limitations during extreme river conditions as identified at Note 6 of Tables A-1 and A-2.
   (a) Annual status reports are due February 28th of each year stating the progress made in evaluating engineering and operational controls to achieve compliance with the final thermal effluent limitations during extreme river conditions as identified at Note 6 of Tables A-1 and A-2.
   (b) No later than one year prior to permit expiration, the permittee shall report to the department the engineering and operational controls to achieve compliance with the final thermal effluent limitations during extreme river conditions as identified at Note 6 of Tables A-1 and A-2.
3. During this permit cycle, the permittee shall continue to implement the Study Plan approved by the department in accordance with Section D.2.d of the operating permit issued by the department on August 1, 2015 regarding this facility.
   (a) Annual status reports are due February 28th of each year detailing the results of the previous year's monitoring events under the Study Plan.
   (b) Six months prior to permit expiration, the permittee shall submit a report detailing how the results of the monitoring program and the recommended path forward to achieve compliance. If a recommendation of the report is reissuance of the 316(a) variance, then a request for reissuance of the 316(a) variance must be submitted detailing how the monitoring program supports the requirements of no appreciable harm, specifically:
      (1) That no appreciable harm has resulted from the normal component of the discharge taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge has been made; or
      (2) If applicable, that despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made.
      (3) If the permittee fails to meet any of the interim dates above, the permittee shall notify the department in writing of the reason for noncompliance no later than 14 days following each interim date.
      (4) Following completion of these studies and the submittal of a renewal application, the permittee may seek a variance from listed thermal effluent limitations. If a thermal variance is requested, the request could include alternative measurement methodologies or criteria, alternative thermal effluent limitations or an alternative schedule to implement physical and/or operational modifications as may be warranted. Based upon the results of the aquatic community studies, the permittee's renewal application submittal and the time necessary for agency(s) review to reach a final determination on the completed studies and the variance request, the deadline for compliance with the final thermal effluent limitations may be modified accordingly

E. SCHEDULE OF COMPLIANCE – *E Coli.*

1. The permittee must attain compliance with the final effluent limits as soon as possible, but no later than August 1, 2017.

2. If the permittee fails to meet any of the interim dates above, the permittee shall notify the department in writing of the reason for noncompliance no later than 14 days following each interim date.

   Please submit progress reports to the Missouri Department of Natural Resources, St. Louis Regional Office, 7545 South Lindbergh, Suite 210, St. Louis, MO 63125.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
STATEMENT OF BASIS
MO-0004812
AMEREN LABADIE- ENERGY CENTER

This Statement of Basis (Statement) gives pertinent information regarding modification(s) to the above listed operating permit for a public comment process. A Statement is not an enforceable part of a Missouri State Operating Permit.

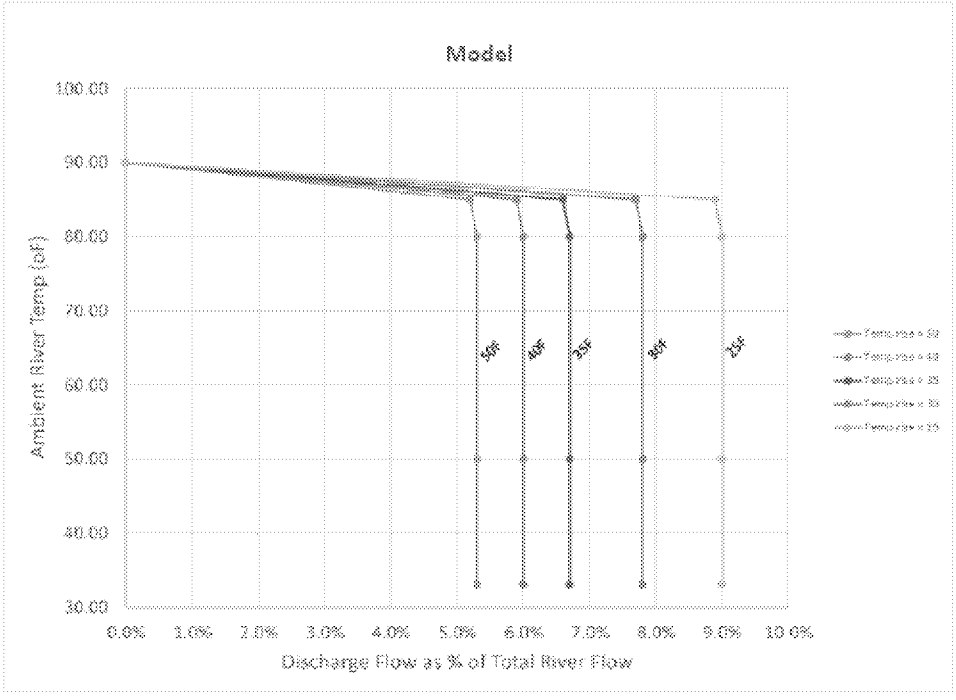
Part I – Facility Information

Facility Type: Major, Categorical, Industrial
Facility SIC Code(s): #4911- Electric Power Generation

Part II – Modification Rationale

The permittee submitted an extensive site-specific analysis of the thermal plume resulting from the discharge of outfall #001 into the Missouri River. The analysis and results present an alternative method to evaluate compliance with the water quality standards for temperature at the edge of the mixing zone, maximum of 90°F and maximum change of 5°F. The thermal plume model has been validated with real water temperature data, under a range of Missouri River conditions and was found to be representative. Upon Department review, the equations and subsequent final water quality-based effluent limitations for the Thermal Discharge Parameter (TDP) adequately evaluate and control the thermal pollution from the discharge. The effluent limit and equations can be found in Table A-1 and A-2 of the permit. The solution for any of the three equations, M2, represents the maximum ratio of effluent flow to total river flow (Qe / (Qs + Qe)), derived from the thermal plume model, that will attain compliance for any combination of effluent temperature (Te) and stream temperature (Ts). Figure 18 from page 54 of Appendix I illustrates the relationship among the variables.

Figure 18: Graphical Solution of the Model for Combinations of River and Ameren Flow and Temperature



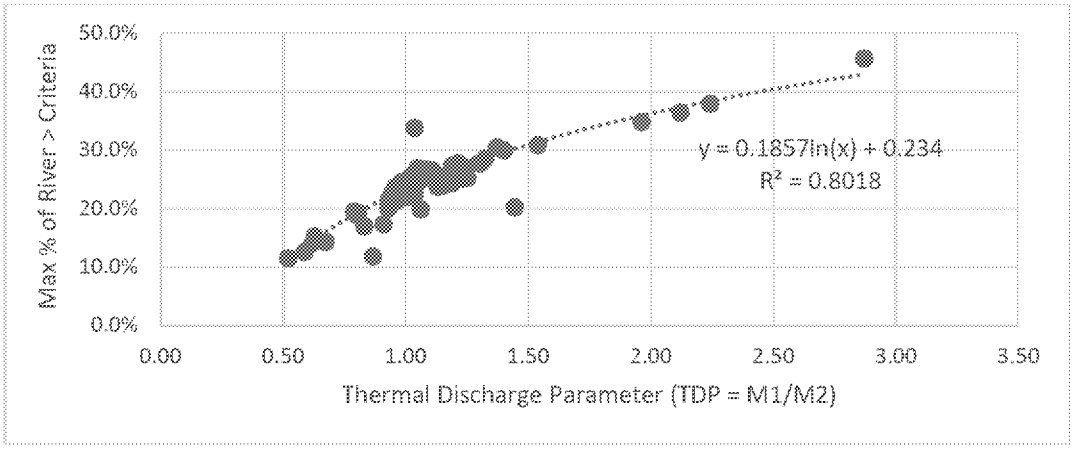
Conversely M1 represents the actual ratio of effluent flow to total river flow, based on daily stream and effluent conditions. As M1, approaches M2, TDP will approach a value of 1. A value of 1 represents the condition as determined from model solutions where the thermal mixing zone is 25% of the receiving stream's flow. A five percent margin of safety has been incorporated in the effluent limit, resulting in the 0.95 limit for TDP. See Appendix I and J for a detailed discussion of the site-specific model. Additional appendices referenced within Appendix I and J may be made available upon request.

Part II – Modification Rationale (Contd)

The permittee is also required to calculate and report the volume of the mixing zone as a percentage of the total river flow. The size of the mixing zone shall be calculated using the following equation:

Mixing Zone = [0.1857 ln (M1 / M2) + 0.234] * 100

This is equation is derived from Figure 5 from page 13 of the Appendix I.



This permit establishes a schedule of compliance which concludes upon expiration of this operating permit, August 1, 2020. During the schedule of compliance the interim effluent limitations for TDP shall not be applicable on days when: 1) Stream temperature is greater than or equal to 87 °F; or 2) Stream flow is less than or equal to 24,000 cfs. On days when one or both of these conditions are met the daily maximum, interim effluent limitation for Outfall #001 shall be 11.16 x 109 BTUs/hr, calculated daily using thermodynamic equations based on generation from all four units. As soon as possible, but no later than August 1, 2020 the permittee must attain compliance with the final effluent limitation for TDP (0.95), unless an alternate final thermal effluent limitation is established in accordance with applicable law.

To provide further information about the model, the permittee will conduct water temperature monitoring when stream flow is less than 35,000 cubic feet per second or when stream temperature is greater than 85 degrees Fahrenheit, as measured at USGS Gage Station 06935550 near Labadie, MO. The plan will include and provide for monitoring to characterize the thermal mixing zone throughout the river, downstream of the point where the thermal discharge channel enters the river. No two such monitoring events will require within six months of each other. The requirement of this special condition shall remain in effect until 1) expiration of the permit or 2) until such time an alternate final thermal effluent limitation is established in accordance with applicable law. The results of sampling shall be reported to the department and compliance shall be determined against the water quality standards for temperature, maximum of 90°F and maximum change of 5°F, at the edge of the thermal mixing zone, except during the schedule of compliance when 1) Stream temperature is greater than or equal to 87 °F; or 2) Stream flow is less than or equal to 24,000 cfs. In addition, for any day for which $0.95 < TDP \leq 1.0$, the permittee may conduct stream monitoring to determine compliance with the water quality standards, in accordance with a monitoring plan approved by the department. The results of sampling shall be reported to the department and compliance shall be determined against the water quality standards for temperature, maximum of 90°F and maximum change of 5°F, at the edge of the thermal mixing zone

In addition, concurrent to this application for modification the permittee has requested authorization to discharge from a new stormwater outfall (East Detention Basin). The East Detention Basin, does not require a construction permit per 10 CSR 20-6.200(B)(11) and is therefore incorporated into this permit modification. The East Detention Basin will receive stormwater and is designed for a 10 year 24 hour precipitation event. The basin will be lined with HDPE. The East Detention Basin will discharge though Outfall #011 and then to the Cooling Water Discharge Channel (Missouri River). As Outfall #011 does not exist yet, Ameren used sampling and data from stormwater outfall #003, as surrogate for identification of parameters of concern. Outfall #011 does have a larger drainage area than Outfall #003; however the BMPs to be installed, including the East Detention basin are more comprehensive than what is currently installed at Outfall #003. The monitoring and reporting requirements for outfall #011 are consistent with those required in the previous permit for outfalls #003-006. The East Detention Basin (Outfall #011) was included in the public notice permit modification dated December 30, 2016.

Further, the modification solicits public comment regarding the Department's thermal BAT analysis reflected in the Fact Sheet reissued by the Department in November 2015.

Last, this permit modification includes; 1) a requirement for electronic report submission through the department's eDMR system; 2) removal of stream flow and temperature measurement and reporting from #010 as this information would be the duplicative of

requirements for #001; 3) Section F, of the August 1, 2015 permit, has been eliminated and is no longer applicable as EPA has promulgated revised 40 CFR 423 Steam Electric Generation Effluent Guide.

Part III – Administrative Requirements

On the basis of preliminary staff review and the application of applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the operating permit. The proposed determinations are tentative pending public comment.

PUBLIC NOTICE:

The Department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest in and water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and permittee must be notified of the denial in writing. The Department must issue public notice of a pending operating permit or of a new or reissued statewide general permit. The public comment period is the length of time not less than 30 days following the date of the public notice which interested persons may submit written comments about the proposed permit. For persons wanting to submit comments regarding this proposed operating permit, then please refer to the Public Notice page located at the front of this draft operating permit. The Public Notice page gives direction on how and where to submit appropriate comments.

[FORMCHECKBOX] - The Public Notice period for this operating permit was Feb. 24th to April 10th, 2017. Further the Department held a public hearing April 13th at 1121 Columbus Lane, Washington, MO. In total, eight comments were received, six of which were presented verbally at the public hearing. See Appendices K and L for comments and the Department's responses.

The following corrections were made to this operating permit which includes:

- Adding a zero to the end of the Y axis UTM coordinate for outfalls #002 and #009
- Adding "minus intake flow" to the definition of Qs (stream flow) on page four of the permit. These words were mistakenly omitted from the definition although the definition was accurate in the supporting documents.
- Mathematical notations were added to the headings preceding each equation on page four of the permit, to clarify interpretation. The changes for each heading is as follows: "When Ts is less than 80°F" was replaced with "When $Ts < 80°F$", "When Ts is between 80°F and 85°F" was replaced with "When $80°F \leq Ts \leq 85°F$" and "When Ts between 85°F and 90°F" was replaced with "When $85°F < Ts < 90°F$", respectfully.
- Note 6 on page 4, related to discharges from Outfall #001 was revised in response to a comment received during the public notice period. The following text was added "On days when one or both of these conditions are met the daily maximum, interim effluent limitation for Outfall #001 shall be 11.16 x 109 BTUs/hr, calculated daily using thermodynamic equations based on generation from all four units."
- The second paragraph of special condition 19 on page 13 was revised in response to a comment received during the public notice period. The text "TDP is greater than 0.95" was replaced with "$0.95 < TDP \leq 1.0$"
- The schedule of compliance date listed on page 15 of the public notice draft permit stated September 28, 2020. This has been revised to the correct date August 1, 2020
- Numerous appendix headers contained incorrect references. They have been corrected.

DATE OF STATEMENT OF BASIS: 04/27/2017

COMPLETED BY:

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
FACT SHEET FOR THE PURPOSE OF RENEWAL OF
MO-0004812
AMEREN MISSOURI-LABADIE ENERGY CENTER

The Federal Water Pollution Control Act ("Clean Water Act" Section 402 Public Law 92-500 as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of storm water from certain point sources. All such discharges are unlawful without a permit (Section 301 of the "Clean Water Act"). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Director of the Missouri Department of Natural Resources (department) under an approved program, operating in accordance with federal and state laws (Federal "Clean Water Act" and "Missouri Clean Water Law" Section 644 as amended). MSOPs are issued for a period of five (5) years unless otherwise specified.

As per [40 CFR Part 124.8(a)] and [10 CSR 20-6.020(1)2.] a Factsheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the Missouri State Operating Permit (operating permit) listed below. A Factsheet is not an enforceable part of an operating permit. This Factsheet is for a Major [FORMCHECKBOX]; Industrial Facility [FORMCHECKBOX]; and/or permit with widespread public interest [FORMCHECKBOX].

Part I – Facility Information

Facility Type: IND
Facility SIC Code(s): 4911- Electric Power Generation

November 2015 factsheet modification: The November 2015 factsheet modification is to add Appendix H: TBEL Determination for once-through cooling. This modification adds additional language and references about Appendix H to the Intake Cooling Water System, Thermal Discharge and 316(a) sections of the factsheet

Facility Description:

The Labadie Energy Center (Labadie) is located 35 miles west of St. Louis, outside Labadie, MO, on 1,100 acres adjacent to the Missouri River. The plant consists of four generating units with a net capability of 2,407 megawatts (MW). The first unit started operating in May 1970 and the plant was fully operational in June 1973. The typical annual generation capacity is between eighteen and nineteen million megawatt hours (18,000,000-19,000,000 MWHR). Labadie burns an average of 10 million tons of Powder River basin sub-bituminous coal annually. On average, Labadie receives two trains of coal per day. The current annual coal combustion production is over 500,000 tons per year. The coal pile size is approximately 67 acres, two million tons and is approximately 50 feet high, which is enough coal for approximately 65 days. Labadie does not have barge loading capabilities.

Other environmental permits and identification numbers associated to Ameren Labadie, include:

- Title V Air Permit from the department's Air Pollution Control Program (2907100003)
- Small Quantity Hazardous Waste Generator under the department's Hazardous Waste Program (MOD079933198)
- Major Water User from the department's Water Resources Program (071300005)
- Solid Waste Construction Permit for Utility Waste Landfill issued January 2, 2015.
- EPA identifies Ameren Labadie with the following EPA ID number: 110000440470

The permit renewal has interim heat rejection limits of 11.16 $x10^9$ British thermal units per hour (btus/hr) with a 10 year schedule of compliance to meet the Missouri Water Quality Standards temperature criteria of 90°F and change in temperature of ±5°F. The heat rejection interim effluent limits are the same as the existing 316(a) variance limits approved in the previous permit renewal. As interim measures with this permit renewal, Labadie is required to reestablish its biological monitoring program both upstream and downstream of the discharge to document any impacts to the biological community in the Missouri River at that location. Six months prior to renewal, Ameren shall submit a report detailing the recommendation for any changes to the facility.

The Labadie Energy Center has two ash ponds: (1) the original ash pond, also called bottom ash pond; and (2) a lined fly ash pond. The bottom ash pond was constructed at the beginning of plant operation in 1970 and does not contain a liner. It has a surface area of 154 acres, with a total storage capacity of 12,000 acre-ft and the current volume of stored ash is approximately 11,403 acre-ft. The fly ash pond is lined and was constructed in 1993. Its total surface area is 79 acres, with a total storage capacity of 1,900 acre-ft and the current volume of stored ash is approximately 1,353 acre-ft. Based on a historic review from 2006 through 2010, Labadie generated an average of 390,000 tons of fly ash and 166,000 tons of bottom ash yearly.

Facility Description: (continued)

According to Ameren's webpage, the proposed future landfill site is located adjacent to the plant and proposed to be 167 acres. See the subsection below on Utility Waste Landfill for more information.

In 1995, Labadie switched to Powder River Basin sub-bituminous coal from bitimunous coal. The switch was to help Labadie meet sulfur oxide (SO_x) requirements from the Air Pollution program. Since the facility has been in operation, the plant has reduced air emissions, increased operating capacity per unit and increased time between outage intervals, as seen in the table below.

	1977	1985	2001
Coal (Btu/lb)	11,000	11,000	8,600
Generation (mwhrs)	12,200,000	13,100,000	16,700,000
Coal Burned (tons)	5,250,000	5,000,000	9,500,000
Max. Unit Capacity	580	580	630
NOx (lb/mbtu)	0.7	0.6	0.115
SOx (lb/mbtu)	6.0	4.8	0.52
Operating Availability	75%	77%	90%
Pulverizer Capacity	90,000	90,000	120,000
Outage Interval	1 year	18 months	3 years

The adjacent Quikrete Concrete Packaging Facility recycles more than 10,000 tons of fly ash and 60,000 tons of bottom ash annually into about two million bags of high-quality concrete mix. The fly ash is used as a partial replacement for Portland cement in the concrete manufacturing process. Because approximately one ton of carbon dioxide (CO_2) is emitted for every ton of Portland cement used to manufacture concrete, the facility represents a 10,000-ton reduction in annual CO_2 emissions ([HYPERLINK "http://www.ameren.com/sites/aue/Archive/ClimateChange/Pages/ADC_ChangeWaste.aspx"])

The closest public drinking water treatment plant and intake on the Missouri River is St. Louis- Howard Bend Water Treatment Plant (MO-0004928) located in Chesterfield, MO. This is approximately 20 miles downstream from the Labadie Energy Center. The St. Charles County PWSD #2 Water Treatment Plant (MO-0087718) has numerous drinking water wells on the northern bank of the Missouri River, approximately 8 miles downstream of Labadie's discharges.

This permit may be modified during its cycle for the addition of groundwater monitoring wells around the existing ash ponds, to incorporate the utility waste landfill and its flows into the permit, to incorporate revised effluent guidelines applicable to the site, new coal combustion residual requirements, and to reflect any other changes at the facility.

Chemical Usage at the Plant

In the renewal application, Ameren provided a list of chemicals used or stored onsite at Labadie. All chemicals used are covered under the facility's Spill Prevention Control Plan. Ameren may want to incorporate the spill plan in with the stormwater prevention pollution plan, to ensure accidental releases are controlled onsite.

Intake Structure

Design intake flow: 1438 MGD
Average intake flow: 966 MGD

The plant's cooling water intake structure is located along the Missouri River shoreline and consists of four cells, one for each unit. Within each cell are 2 bays containing a 10 foot wide vertical conventional traveling screen for a total of eight traveling screens for the entire intake. There is a ten foot wide by nine foot high upper opening and a nine foot wide by seven foot high lower opening to each bay. At the mouth of the opening there are steel trash racks made of bars with 2.5 inch clearing spacing. The intake is equipped with a mechanical rake to clear debris from the trash racks.

The traveling screens have ½ inch woven wire mesh and are operated once per 8 hour shift for 1.25 revolutions at 5 feet per minute (fpm). If a 6 inch head differential occurs, the screens automatically will rotate at 20 feet per minute until the head differential is reduced to 4 inches, after which the rotation speeds reduce to 5 fpm. Debris and fish on the screens are removed by front and rear mounted spray washes at 100 psi, and are collected in screenwash troughs located in front of and behind the screens. The screenwash troughs lead to an inclined pipe discharging to the river at the downstream end of the intake structure.

The heated water is discharged through an 8 foot diameter pipe leading to a seal well, where the water flows over a weir into a 0.22 mile discharge canal located downstream from the intake structure. A warming line recirculates heated water back to the intake to prevent ice buildup in the winter.

In addition to the narrative description below for each of the ten (10) outfalls, there is a flow diagram for the outfalls located in Appendix B: Flow Diagram.

Outfall #001 – Non-contact Cooling Water:
Outfall #001 discharges once-through cooling water that is withdrawn from the Missouri River. The cooling water is passed through condensers and other heat exchangers and is discharged to the Missouri River. The water flows through a 0.22 mile discharge canal. Portions of the cooling water system are intermittently treated with biocides, which is discussed below. The cooling water is also used to lubricate the circulating water pump bearings in the intake structure. This lubrication water mixes with the normal pump flow and is a component of the average outfall flow (less than 0.02% of the discharge flow).

The permittee's current approach to macroinvertebrate control consists of molluscicide treatment of intake structures cells, auxiliary coolers (condensate, condensers, jacket water coolers), and high and low pressure untreated (raw) water systems using commercial product. The use of the commercial products may cause the need for a Federal (EPA) pesticide permit.

Appendix H: TBEL determination for once-through cooling and thermal discharges was added to the factsheet in November 2015 as a discussion on why at this time, once-through cooling is still the best available technology for the Labadie Energy Center. At permit renewal in 2020, the TBEL analysis will be required to be redone and will also include the results of the biological study Ameren is required to undertake for thermal discharges and for impingement and entrainment, required by 316(a) and (b).

Outfall #002 – Ash Pond:
Outfall #002 is the discharge from the facility's wastewater treatment pond that provides treatment for fly ash and bottom ash sluice water, other low volume wastes, coal pile run-off and stormwater run-off via sedimentation and neutralization. This facility generates approximately 83,000 tons of bottom ash and 194,000 tons of fly ash per year. Fly ash is conveyed dry to silos or wet sluiced to the ash pond and bottom ash is conveyed to the ash pond from which they can be respectively recovered for beneficial use projects. Based on a historic review from 2006 through 2010, Labadie generated an average of 390,000 tons of fly ash and 166,000 tons of bottom ash yearly. Other sources of wastewater that are discharged from Outfall #002 include: Mill Pyrite Removal System; Bottom Ash Removal System; Sanitary Wastewater (Outfall #02A); Fly Ash Removal System; Demineralizer Sump; Coal Reclaim Tunnel Sump; and Coal Pile Run-off.

Outfall #02A– Domestic Wastewater Treatment Plant:
This outfall consists of treated domestic wastewater from an activated sludge treatment plant. The effluent is discharged to the ash pond and released via Outfall #002. Domestic wastewater from the whole facility is treated at the plant. Sludge/biosolids are removed by contract hauler. Labadie retains a contract hauler to take sludge to MSD Bissell Point (MO-0025178) for incineration. At Labadie, there is storage capacity for 8,500 gallons, which is about 138 days. Design sludge production is for 0.85 dry tons per year. The permit contains a schedule of compliance for Ameren to install disinfection at the treatment plant. Ameren plans to install ultraviolet disinfection. Ameren will need to apply for a construction permit for the Department for the construction of the disinfection system.

Outfall #003-Stormwater Runoff:
Outfall #003 is representative of three similar discharge areas. This outfall drains a total of 5 acres, with 3.8 acres impervious surface. These areas are predominantly employee vehicle parking areas. The first discharge point drains stormwater from the paved employee parking and the unpaved overfill employee parking areas. The second discharge point drains stormwater from the largest area of the paved employee parking lot. The second drainage area is considered Outfall #003 as it the location most likely to note oil and grease discharges. The third discharge point drains part of the paved employee parking lot and a grassy area in front of the administration building. Stormwater runoff from these locations drains to the Missouri River.

Outfall #004-Stormwater Runoff:
Outfall #004 is a stormwater outfall from a single pipe that drains runoff from a paved outdoor materials storage area. The discharge goes through a swale in the Missouri River. This outfall drains 1.4 acres, all of which is impervious surface.

Outfall #005-Stormwater Runoff:
Outfall #005 drains stormwater runoff from the paved access roads at the water treatment plant and the immediately adjacent gravel lined drainage swales. This outfall drains 0.1 acres, with 0.05 acres impervious surface. The yard drains around the water treatment plant are routed to the Ash Pond and final discharge through Outfall #002. Outfall #005 is a single pipe, which discharges to a partially levied area on the bank of the Missouri River. The two inlets to the pipe are contained within separate concrete-walled detention structures, which allow localized settling during storm events prior to discharge.

Outfall #006- Stormwater Runoff:
Outfall #006 is representative of multiple discharges along the plant access road. This outfall drains 3.7 acres, with 1.8 acres impervious surface. These discharges are all located along the plant access road, predominately at the northwestern edge of the coal pile. Stormwater runoff from the paved access road and from the gravel lined drainage swale between the access road and the railroad tracks is discharge from pipes beneath the road. The inlets are contained within a concrete walled detention structure, which is recessed into a paved apron. During routine storm events, these structures reduce stormwater runoff velocities, allowing localized settling. This outfall discharges to the Missouri River through the man-made canal for Outfall #002.

Outfall #007 and #008- Stormwater runoff:

Outfalls #007 and #008 are remote from routine plant operations and plant related wastewaters systems. Monitoring is waived for these outfalls as Ameren has installed best management practices. Outfall #007 is representative of multiple discharges along the plant access road remote from active plant areas. All discharges are used to drain stormwater from the paved access road and from the adjacent gravel areas between the access road and the railroad tracks. Each discharge has a small concrete drop structure at its inlet. This outfall drains 3.3 acres, with 1.7 acres impervious surface. Outfall #008 is representative of discharges along the plant access road even more remote from plant active areas than Outfall #007. Discharges in this area go to a wetland mitigation area and to Labadie Creek. This outfall drains 1.0 acres, with 0.5 acres impervious surface. Monitoring was not established for these outfalls due to the distance from plant operations and the small chances for discharges.

Outfall #009 – Ash Pond Emergency Spillway:

Ameren has installed an emergency spillway on the Ash Ponds. The addition of the spillway is based on the recommendation of the department's Dam Safety Program. The emergency spillway is at the south side of the bottom ash pond. The emergency spillway is designed for the 100 year, 24 hour storm event (~7 inches, according to Urban Hydrology for Small Watersheds, Table B-8). The watershed area for the emergency spillway is 308 acres. The emergency spillway would discharge in the event of an extreme precipitation event, along with loss of power or mechanical failure of transfer and discharge pumps.

Have any changes occurred at this facility or in the receiving water body that effects effluent limit derivation?
Yes [FORMCHECKBOX]: Outfall #001: Thermal discharge effluent limits are retained as interim effluent limits.

- The permit also contains a schedule of compliance for establishment of biomonitoring.
- The previous permit contained a condition to report when the thermal discharge exceeded the change in temperature by more than 5°F. However, the condition was not applied correctly as it was tracking exceedance, not actual change in temperature. The exceedance of the change in temperature requirements applies to thermal discharges on the Mississippi River, not the Missouri River. The previous permit did not require temperature monitoring upstream of the discharge to track the change in temperature.
- As part of the Technology Based Effluent determination for thermal compliance and once-through cooling, see Appendix H for the discussion on why once-through cooling is still the best available technology at Labadie, at this time.

- Outfall #02A has interim and final limits for *E. Coli*, while the previous permit did not contain bacteria limits.
- Outfall #002-Ash Ponds
  - This permit proposes additional monitoring at Outfall #002 if the revised 40 CFR 423 effluent limit guideline is not finalized within a year of permit issuance. The requirement is to provide enough data points to conduct a reasonable potential analysis or to redo the best technology analysis in Appendix C.
  - For information on action taken on the seeps, please see the discussion below.
  - As part of the Technology Based Effluent determination, monitoring is required for boron at Outfall #002, see Appendix C.
  - Labadie is also required to establish a groundwater monitoring program to characterize movement and potential impacts of groundwater around the ash ponds.
- This permit establishes benchmark monitoring requirements for stormwater outfalls #003-#006 and the development of a Stormwater Pollution Prevention Plan.
- Monitoring is waived for outfalls #007 - #008, as they are removed from plant operations, see Appendix A: Facility Map.
  - Outfall #007 was removed from monitoring, as it is located at the plant's entrance, is not located near plant operations, has BMPs installed, and in review of the DMR data available is often at the detection level of the test methods. Outfall #007 is still required to be included in the SWPPP and sampled prior to reapplication at renewal. If there is a change in operations that would affect Outfall #007 or the drainage area to #007, benchmarks and monitoring will be reevaluated.
  - Outfall #008 did not have monitoring requirements under the previous operating permit.
- Outfall #009 added due to construction of emergency spillway at ash pond upon the recommendation of Missouri Department of Natural Resources Water Resources Center Dam Safety Program in consultation with Ameren.

Application Date:	09/16/1998; revised application submitted 12/28/2011 and April 02, 2012	
Expiration Date:	03/17/1999	
Last Inspection:	12/11/2012	In Compliance [FORMCHECKBOX];

OUTFALL(S) TABLE:

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE	DISTANCE TO CLASSIFIED SEGMENT (MI)
001	2,213	Once-through	Noncontact Cooling Water	0.0
002	89.59	Settling, Neutralization	Process wastewater, domestic, stormwater	0.0
002A	0.078	Secondary	Domestic	0.0
003	NA	BMPs	Stormwater	0.0
004	NA	BMPs	Stormwater	0.0
005	NA	BMPs	Stormwater	0.0
006	NA	BMPs	Stormwater	0.0
007	NA	BMPs	Stormwater	~0.1
008	NA	BMPs	Stormwater	~0.12
009	89.59	BMPs	Emergency Spillway	~0.12

Comments:

E. Coli Schedule of Compliance:
Missouri adopted whole body contact (WBC-B) designated use in 2006 for the Missouri River. Because the permit was administratively continued, the department was previously unable to establish bacteria requirements in the permit.
10 CSR 20-7.015(9)(J)(1) does state that if the designated use was established prior to 2012, the facility would need to be in compliance by December 31, 2013. However, again as the permit has been administratively continued since before 2006 when the designated use was established, 10 CSR 20-7.015(9)(J)(2) allows the establishment of a schedule of compliance and as such a two year schedule of compliance is being given. In conversations with Ameren, they are preparing for this requirement and are plan to apply for a construction permit for ultraviolet disinfection. A construction permit from the Department will be required for the installation of the disinfection system.

Thermal Limitations Schedule of Compliance:
The temperature compliance schedule is designed to coordinate studies addressing both the cooling water intake and the discharge limits at the Labadie Energy Center. 40 CFR 122.47 is the federal schedule of compliance which is as soon as practicable.
10 CSR 20-7.031 was amended in 2012 to allow schedules of compliance to extend past 3 years, which was approved by EPA in 2013. The compliance schedule are appropriate when there is a newly imposed permit condition, such as the thermal effluent limits. This permit requires Ameren to meet a thermal effluent limit of 90°F and to monitor compliance with the prohibition against ±5°F upon expiration of the interim effluent limit as these are new permit conditions. The schedule of compliance does not violate the federal anti-backsliding regulations as the facility's previously issued thermal heat rejection limits were approved as a variance with the water quality standards; with this permit renewal the interim limits are in place for protection of the Missouri Water Quality Standards until compliance is achieved.

As part of the Technology Based Effluent determination for once-through cooling, Appendix H was completed which provides the justification on the cost to install a different cooling technology and the impacts a different cooling technology may have on the environment and operations at the facility if Labadie Energy Center was retrofitted for closed-cycle cooling.

Pollutants Typically Associated with Steam Electric Industry Discharges:
The US EPA *Interim Detailed Study Report for the Steam Electric Power Generating Point Source Category* (Interim Study Report) utilized available data to characterize the waste streams discharged from steam electric facilities, as well as the technologies and practices used in the industry to control the discharge of waste pollutants (Chapter 5). EPA is expected to release the updated effluent limit guidelines in 2014. Table 5-1 in Chapter 5 of the Interim Study Report presents an overview of the types of pollutants associated with the various waste streams. Pollutants contained in the Interim Study Report are based on data previously collected by the EPA during the 1974 and 1982 rulemaking efforts and the 1996 Preliminary Data Summary, data provided by the Utility Water Act Group (UWAG) and Electric Power Research Institute (EPRI). Staff has reviewed the Discharge Monitoring Reports (DMRs) and renewal applications Forms C and D for each of the outfalls in this operating permit. Effluent testing results contained in Forms C and D for each outfall were compared directly with pollutants associated with the various waste streams for each of the outfalls. Below is the list of pollutants based on process waste streams for this facility:

- Cooling Water: Once-Through or Cooling Tower Blowdown (Outfall #001):
  Chlorine, Iron, Copper, Nickel, Aluminum, Boron, Chlorinated Organic Compounds, Suspended Solids, Brominated Compounds, and Non-Oxidizing Biocides.

- Ash Handling: Bottom or Fly Ash (Outfall #002):
  TSS, Sulfate, Chloride, Magnesium, Nitrate, Aluminum, Antimony, Arsenic, Boron, Cadmium, Chromium, Copper, Cyanide, Iron, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vandium, and Zinc.

- Coal Pile Runoff (Outfall #002):
  Acidity, COD, Chloride, Sulfate, TSS, Aluminum, Antimony, Arsenic, Boron, Beryllium, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Vandium, and Zinc.

- Other Low-Volume Waste Streams (Outfall #002):
  Suspended Solids, Dissolved Solids, Oil and Grease, Phosphates, Surfactants, Acidity, Methylene Chloride, Phthalates, BOD_5, COD, Fecal Coliform and Nitrates.

For the above pollutants, staff drafting this operating permit only compared the applicable pollutants based on Missouri's Water Quality Standards criteria and designated uses, see Appendix D for Outfall #002 discussion. For any of the outfalls that do not contain one of the process wastewater types above, these pollutants were not reviewed (i.e., Outfalls #02A - #008). For Outfalls #003 and 004, stormwater outfalls, staff drafting this permit and fact sheet reviewed the applicable Forms 2F, C, and D to determine if effluent from this outfall had potential to exceed Missouri's Water Quality Standards for the tested pollutants. For discussion on best professional judgment TBEL determination, please see Appendix C: TBEL Determination. In the review of the background data from 1969 to 2012 of the Missouri River at Hermann, and compared to the concentrations Ameren sampled for, boron has been identified as constituent of concern and this permit requires quarterly monitoring for the permit cycle. The TBEL discussion in Appendix C focuses on the removal of boron from the water, as that was the parameter identified through the TBEL analysis. This permit proposes additional monitoring at Outfall #002 if the revised 40 CFR 423 effluent limit guideline is not finalized within a year of permit issuance. The requirement is to provide enough data points to conduct a reasonable potential analysis or to redo the best technology analysis in Appendix C. Ameren is pursuing a utility waste landfill for storage and disposal of coal combustion residuals (ash).

Part II – Operator Certification Requirements

As per [10 CSR 20-6.010(8) Terms and Conditions of a Permit], permittees shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions and regulations. Operators or supervisors of operations at regulated wastewater treatment facilities shall be certified in accordance with [10 CSR 20-9.020(2)] and any other applicable state law or regulation. As per [10 CSR 20-9.010(2)(A)], requirements for operation by certified personnel shall apply to all wastewater treatment systems, if applicable, as listed below:

Not Applicable [FORMCHECKBOX]; This facility is not required to have a certified operator.

Part III – Receiving Stream Information

APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:
As per Missouri's Effluent Regulations [10 CSR 20-7.015], the waters of the state are divided into seven (7) categories. Each category lists effluent limitations for specific parameters, which are presented in each outfall's Effluent Limitation Table and further discussed in the Derivation & Discussion of Limits section.

Missouri or Missouri River [10 CSR 20-7.015(2)]: [FORMCHECKBOX]
All Other Waters [10 CSR 20-7.015(8)]: [FORMCHECKBOX]

10 CSR 20-7.031 Missouri Water Quality Standards, the department defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1st classified receiving stream's beneficial water uses to be maintained are located in the Receiving Stream Table located below in accordance with [10 CSR 20-7.031(3)].

RECEIVING STREAM(S) TABLE:

WATERBODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	EDU**
Tributary to Labadie Creek	--	--	General Criteria	10300200-0603	Ozark/ Moreau/ Loutre
Labadie Creek	P	1693	AQL, LWW, WBC(B)		
Missouri River	P	1604	AQL, DWS, IND, LWW, SCR, WBC(B)		

* - Protection of Warm Water Aquatic Life and Human Health-Fish Consumption (AQL), Cool Water Fishery(CLF), Cold Water Fishery (CDF), Drinking Water Supply (DWS), Industrial (IND), Groundwater (GRW), Irrigation (IRR), Livestock & Wildlife Watering (LWW), Secondary Contact Recreation (SCR),Whole Body Contact Recreation (WBC).
** - Ecological Drainage Unit

RECEIVING STREAM(S) LOW-FLOW VALUES TABLE:

RECEIVING STREAM (C, P)	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Labadie Creek	0.1	0.1	1.0
Missouri River[i]	23,337	39,013	55,169

[i] Missouri River flow data is from USGS Gaging station 06934500 at Hermann, MO from July 1969 to July 2012.

MIXING CONSIDERATIONS TABLE:

RECEIVING STREAM	MIXING ZONE (CFS) [10 CSR 20-7.031(4)(A)…]		ZONE OF INITIAL DILUTION (CFS) [10 CSR 20-7.031(4)(A)…]	
	7Q10	30Q10	1Q10	7Q10
Labadie Creek	0.025	0.25	0.0025	0.02
Missouri River[i]	9,753.25	1,3792.25	975.32	1,379.23

[i]: default mixing of 25% for pollutants of concern, for Outfalls 002-004,008-009

Outfalls #005 - #009: Mixing Zone: Not Allowed [10 CSR 20-7.031(5)(A)4.B.(I)(a)]
Zone of Initial Dilution: Not Allowed [10 CSR 20-7.031(5)(A)4.B.(I)(b)].

MIXING CONSIDERATIONS - THERMAL:

Missouri's Water Quality Standards [10 CSR 20-7.031(4)(A)1.], specifically state that mixing considerations for toxics do not apply to thermal mixing considerations and that thermal mixing considerations are located in [10 CSR 20-7.031(5)(D)6.], which states thermal mixing considerations are limited to 25% of the cross-sectional area or volume of a river, unless a biological survey performed in accordance with 316(a) of the Clean Water Act indicate no significant adverse effect on aquatic life. For the purpose of mixing considerations, the department typically uses the 25% of the daily flow vs cross-sectional area. However, based on Thermal Plume Study information presented to the department by Ameren, the permit is being reissued with the thermal discharge effluent limits, as previously granted in the permit issued with the approval of the 316(a) variance as interim effluent limits. This permit requires new data to be collected for the characterization of the biological community around Labadie and for the potential reissuance of the 316(a) at the next permit renewal or compliance with the department's temperature criteria in ten years.

RECEIVING STREAM MONITORING REQUIREMENTS:

This permit does not identify where instream/receiving stream monitoring will occur. As part of the reestablishment of the biomonitoring program for 316(a) and for compliance with the monitoring requirements of 316(b), the facility is required to establish a representative biomonitoring program, upstream and downstream of the effluent discharges and monitoring at the intake structure. The department will work with the permittee to review any proposed monitoring programs.

Part IV – Rationale and Derivation of Effluent Limitations & Permit Conditions

ALTERNATIVE EVALUATIONS FOR NEW FACILITIES:
As per [10 CSR 20-7.015(4)(A)], discharges to losing streams shall be permitted only after other alternatives including land application, discharges to a gaining stream and connection to a regional wastewater treatment facility have been evaluated and determined to be unacceptable for environmental and/or economic reasons.

Not Applicable [FORMCHECKBOX]: The facility does not discharge to a Losing Stream as defined by [10 CSR 20-2.010(36)] & [10 CSR 20-7.031(1)(N)], or is an existing facility.

ANTI-BACKSLIDING:
A provision in the Federal Regulations [CWA §303(d)(4); CWA §402(c); 40 CFR Part 122.44(I)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

Applicable [FORMCHECKBOX]: Limitations in this operating permit for the reissuance of this permit conform to the anti-backsliding provisions of Section 402(o) of the Clean Water Act, and 40 CFR Part 122.44.

[FORMCHECKBOX] - The Department determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under section 402(a)(1)(b).

- This permit changes WET test requirements for the facility from a pass/fail requirement to monitoring only for toxic units. This change reflects modifications to Missouri's Effluent Regulation found at 10 CSR 20-7.015. 40 CFR 122.44(d)(1)(ii) requires the Department to establish effluent limitations that control all parameters which have the reasonable potential to cause or contribute to an excursion above any state water quality standard, including state narrative criteria. The previous permit imposed a pass/fail limitation without collecting sufficient data to make a reasonable potential determination. Furthermore, the method of reporting associated with the pass/fail limitation prevented the Department from gathering the data necessary to make a finding of reasonable potential. Implementation of the toxic unit monitoring requirement will allow the Department to implement numeric acute criteria in accordance with water quality standards established under §303 of the CWA.
- The previous permit limits were established in error, based on limits for other industrial facility discharge. This renewal establishes limits appropriate for stormwater discharges. There will be no changes to industrial activities onsite or the composition of the stormwater discharge as a result of this renewal. The benchmark concentrations and required corrective actions are protective of the applicable water quality standards.
    - The establishment of daily maximum benchmarks for Outfall #003-#006 is to meet the goals of EPA's memo and provide clear, specific and measurable elements for BMP installation and supports an adaptive management approach to meeting water quality at a large industrial facility, as discussed in EPA's November 26, 2014 Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on those WLAs" Memo:

      "Permits should contain clear, specific, and measurable elements associated with BMP implementation (e.g., schedule for BMP installation, frequency of a practice, or level of BMP performance), as appropriate, and should be supported by documentation that implementation of selected BMPs will result in achievement of water quality standards. Permitting authorities should also consider including numeric benchmarks for BMPs and associated monitoring protocols for estimating BMP effectiveness in stormwater permits. Benchmarks can support an adaptive approach to meeting applicable water quality standards. While exceeding the benchmark is not generally a permit violation, exceeding the benchmark would typically require the permittee to take additional action, such as evaluating the effectiveness of the BMPs, implementing and/or modifying BMPs, or providing additional measures to protect water quality." ([HYPERLINK "http://water.epa.gov/polwaste/npdes/stormwater/upload/EPA_SW_TMDL_Memo.pdf"])
    - Under EPA's Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits, it is stated that "If the permitting authority determines that, through implementation of appropriate BMPs required by the NPDES storm water permit, the discharges have the necessary controls to provide for attainment of WQS and any technology-based requirements, additional controls need not be included in the permit" . ([HYPERLINK "http://nepis.epa.gov/Exe/ZyNET.exe/20004CQN.txt?ZyActionD=ZyDocument&Client=EPA&Index=1995%20Thru%201999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A\\ZYFILES\\INDEX%20DATA\\95THRU99\\TXT\\0

0000006\\20004CQN.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h|-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p|f&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1"])

- Under 10 CSR 20-6.200(2)(B)3, "Facilities which meet the following definitions are considered to be included in this subsection:…D. Steam electric power generating facilities, including coal handling sites." This requirement references back to 10 CSR 20-6.200(2)(A) including immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility. With this requirement, outfalls #007 and #008 were established in previous permits and do not qualify for no exposure. With the BMPs installed on-site and with the exemption in 10 CSR 20-6.200(1)(B)2 for areas located on plant lands separate from the plant's industrial activities, the permit writer's best judgment was to require the outfalls to be covered in the SWPPP, the BMPs be maintained, and that monitoring would be waived this permit cycle.
- Outfall #007 was removed from monitoring, as it is located at the plant's entrance, is not located near plant operations, has BMPs installed, and in review of the DMR data available is often at the detection level of the test methods. The Outfall #007 is still required to be included in the SWPPP and sampled prior to reapplication at renewal. If there is a change in operations that would affect Outfall #007 or the drainage area to #007, benchmarks and monitoring will be reevaluated.
- Outfall #008 did not have monitoring requirements under the previous permit

- The previous permit contained a condition to report an estimate of the percentage of the stream flow in excess of 5°F temperature increase, based on heat rejection and river flow. These estimates were not based on upstream river temperature nor Outfall #001 effluent temperature or flow. While Missouri's thermal water quality standards are referenced in the current permit, the existing limits issued pursuant to the 316(a) variance, were found to be protective of aquatic life and provide relief from both effluent temperature limits and otherwise applicable water quality standards. This permit also contains a general reference to water quality standards, however the interim limits are intended to provide the same level of relief until the final permit limits are implemented as a schedule of compliance is appropriate for achieving compliance with the 90°F, as the previous permit did not contain the limit. This permit also requires extensive studies to re-evaluate the extent of the thermal impacts.

ANTIDEGRADATION:
In accordance with Missouri's Water Quality Standard [10 CSR 20-7.031(2)], the department is to document by means of Antidegradation Review that the use of a water body's available assimilative capacity is justified. Degradation is justified by documenting the socio-economic importance of a discharging activity after determining the necessity of the discharge.

Not Applicable [FORMCHECKBOX]: Renewal no degradation proposed and no further review necessary. Prior to modifying this permit to reflect the addition of the utility waste landfill or the addition of scrubbers, an Antidegradation review and public notice will be required. The establishment of the emergency spillway, Outfall #009, does not require an Antidegradation Review as it will be operated as a no discharge system.

AREA-WIDE WASTE TREATMENT MANAGEMENT & CONTINUING AUTHORITY:
As per [10 CSR 20-6.010(3)(B)], …An applicant may utilize a lower preference continuing authority by submitting, as part of the application, a statement waiving preferential status from each existing higher preference authority, providing the waiver does not conflict with any area-wide management plan approved under section 208 of the Federal Clean Water Act or any other regional sewage service and treatment plan approved for higher preference authority by the department.

BIOSOLIDS & SEWAGE SLUDGE:
Biosolids are solid materials resulting from domestic wastewater treatment that meet federal and state criteria for beneficial uses (i.e. fertilizer). Sewage sludge is solids, semi-solids, or liquid residue generated during the treatment of domestic sewage in a treatment works; including but not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works. Additional information regarding biosolids and sludge is located at the following web address:
[HYPERLINK "http://dnr.mo.gov/env/wpp/pub/index.html"], items WQ422 through WQ449.

[FORMCHECKBOX] - Sludge/biosolids are removed by contract hauler or are stored in the lagoon. Labadie retains a contract hauler to take sludge to MSD Bissell Point (MO-0025178) for incineration. At Labadie, there is storage capacity for 8,500 gallons, which is about 138 days. Design sludge production is for 0.85 dry tons per year.

COAL COMBUSTION RESIDUALS (CCR):

Coal Combustion Residuals (CCR), often referred to as coal ash, are currently considered solid waste, not hazardous waste, under an amendment to RCRA, the Resource Conservation and Recovery Act. Coal ash is residue from the combustion of coal in power plants and that was captured by pollution control technologies, like precipitators or scrubbers. Potential environmental concerns from coal ash pertain to pollution from impoundments and landfills leaching into groundwater and structural failures of impoundments.

The US EPA is currently proposing the first-ever national rules to ensure the safe disposal and management of coal ash from coal-fired power plants under the nation's primary law for regulating solid waste, the RCRA. EPA published the final rule on April 17, 2015 in the Federal Register. [HYPERLINK "http://www2.epa.gov/coalash/coal-ash-rule"]. The department is currently reviewing the rule.

The Labadie Energy Center has two ash ponds: (1) the original ash pond, also called bottom ash pond; and (2) a lined fly ash pond. The bottom ash pond was constructed at the beginning of plant operation in 1970 and does not contain a liner. It has a surface area of 154 acres, with a total storage capacity of 12,000 acre-ft and the current volume of stored ash is approximately 11,403 acre-ft. The fly ash pond is lined and was constructed in 1993. Its total surface area is 79 acres, with a total storage capacity of 1,900 acre-ft and the current volume of stored ash is approximately 1,353 acre-ft.

Based on a historic review from 2006 through 2010, Labadie generated an average of 390,000 tons of fly ash and 166,000 tons of bottom ash yearly. Bottom ash is wet sluiced to the old ash pond where it is reclaimed for beneficial reuse. Beneficial reuse averages 70,000 tons per year, but can vary greatly, as seen in 2006 when 600,000 tons were used. Beneficial reuses of bottom ash include use as a highway traction enhancement material, and as an aggregate replacement in commercial dry-concrete product. Ameren has a contract with Charah, a firm, to market bottom ash and manage ponded material sizing, sorting, removal and transport off-site. Bottom ash is supplied to the Quikrete Plant (MO-G491128) adjacent to Labadie.

Fly ash is conveyed by a dry handling system to a series of silos, operated by the ash marketing firm Mineral Resource Technologies (MRT), from which it can be pneumatically transferred into trucks and railcars for transport off-site. Ash is also transferred from silos operated by Ameren, for placement into the fly ash pond after wetting for stabilization. Dry fly ash from Labadie is utilized primarily as a feedstock in ready-mix concrete production. It can also be used for flowable fill, soil stabilization, and as a road base material. Ameren reports that over 50% of the fly ash produced annually is managed by MRT and transferred offsite, with the remaining balance deposited into the fly ash pond.

This operating permit contains a special condition to address concerns regarding ash ponds at this facility and their potential to impact groundwater. Missouri Water Quality Standard 10 CSR 20-7.031(5)(A) states, "*Water contaminants shall not cause or contribute to exceedances of Table A, groundwater limits in aquifers and caves...*" and 10 CSR 20-7.015(7) states, "*No person shall release any water into aquifers, store or dispose of water in a way which causes or permits it to enter aquifers either directly or indirectly unless it meets the requirements of section (9) of this rule and it meets the appropriate groundwater protection criteria set in 10 CSR 20-7.031.*" The established special condition will allow the department to (1) determine if groundwater is being impacted from either the lined or unlined coal ash impoundments, (2) establish controls, limits, management strategies, and/or groundwater cleanup criteria.

This permit requires groundwater monitoring around both ash ponds to evaluate the potential of discharges to groundwater, which is a water of the state. This permit is to comply with the requirements in 644.143 RSMo and to establish a long term approach and stewardship of the site and the beneficial uses of the groundwater on this site. This permit does not implement the federal CCR rule, as that is a self-implementing rule and covered under RCRA. This permit does not shield a facility from the CCR requirements. Compliance with the terms and conditions of this permit that are identical to or more stringent than the requirements in the federal CCR rule may constitute compliance with the federal CCR rule.

VISUAL INSPECTION OF THE AMEREN MISSOURI LABADIE POWER PLANT FLY ASH AND BOTTOM ASH IMPOUNDMENT DAM
By Robert Clay and Paul Simon of Missouri Dam and Reservoir Safety Program staff

On February 22, 2012, Robert Clay and Paul Simon of the Missouri Dam and Reservoir Safety Program staff inspected the embankments that impound fly ash and bottom ash at the Labadie Power Plant. The plant is owned and operated by Ameren Missouri Corporation. We were accompanied by Mr. Tom Siegel of the St. Louis regional office of the department of Natural Resources and several representatives of Ameren, Including Mr. Matt Frerking of Ameren's dam safety program.

The purpose of the inspection was to identify observable defects or maintenance deficiencies on the embankment structures and appurtenant works. The dam consists of an earthfill embankment extending from the northeast corner of the plant site and ending near the southwest corner of the coal stockpile area. There is an interior dike which splits the impoundment into two cells, one which contains fly ash and the other bottom ash. The maximum height of the dam crest above the surrounding floodplain is 29 feet. The fly ash cell is equipped with a plastic liner. The ash is transported to the ponds in slurry form. Excess water from the fly ash pond is pumped into the bottom ash pond through two- 8-inch diameter pipes. The pumps are activated automatically when the water level reaches a pre-set elevation. Excess water from the bottom ash pond exits the structure through a 36-inch diameter pipe via gravity flow. Flow through this pipe can be controlled by operation of two butterfly valves located near the pipe outlet.

The embankment was inspected by driving the crest and toe of the embankment in all terrain utility vehicles, with stops at several areas of interest, including both outlet structures and several wet areas along the toe of the embankment. The embankment appeared to be well maintained, with frequent mowing and removal of brushy vegetation, as needed. According to Mr. Frerking, the embankment is being mowed three times yearly. This frequency of mowing is adequate for an impoundment embankment. Several wet zones were observed along the toe of the embankment. Some of these areas appear to be permanently wet as indicated by the presence of water tolerant vegetation such as cattails and Horsetail reed. Most of the wet areas had no flow and were characterized by standing water or damp soil. The exception was an area along the west side of the bottom ash cell, where flowing seepage has historically been observed. Ameren has recently constructed a slurry cutoff wall along this side of the embankment. The cutoff has been successful in reducing the observed flow considerably. On the day of the inspection, the cumulative flow is negligible. Standard protocol on impoundment dams is to observe wet areas on a regular schedule for increases in flow, changes in clarity or color, and changes in the areal extent of the wetness. If such changes are noted, an investigation of the cause should be made by qualified engineers who are experienced in dam construction and operation.

The embankment appeared to be stable, with no scarps, bulges, cracks, depressions or other indications of land sliding, erosion or settlement. The west embankment had minor surface irregularities which may have been caused by recent clearing of trees and brush from the area. A few groundhog burrows were also observed in this area. The embankment is extremely wide at this point and the burrows are not a threat to the integrity of the dam, but the groundhogs should be trapped and removed and the burrows repaired. Small burrows were noted elsewhere, but these appeared to be moles and small rodents and pose no threat to the embankment.

Both outlet structures were observed. They appear to be in good condition and operating properly. Both structures are controlled spillways, which are operated automatically, meaning there is no human operator. This embankment is under 35 feet high and therefore not regulated under state dam safety statute. Regulated dams are required to have uncontrolled spillways that are adequate to protect the embankment from overtopping during extreme floods. The embankments at the Labadie fly ash ponds do not have nor are required to have an uncontrolled spillway.

In summary, it is our opinion that the Labadie ash pond dam is in good condition and is performing adequately. Ameren has a full time dam safety program and conducts regular inspections of the dam. In addition, the plant is staffed 24 hours per day, and plant personnel perform weekly inspections of the embankments and appurtenant structures. We believe that there are no deficiencies that currently threaten the integrity of the dam. However, we would recommend that Ameren consider constructing an uncontrolled spillway to allow for the safe discharge of flood waters should the controlled spillways fail to operate.

COMPLIANCE AND ENFORCEMENT:
Enforcement is the action taken by the Water Protection Program (WPP) to bring an entity into compliance with the Missouri Clean Water Law, its implementing regulations, and/or any terms and conditions of an operating permit. The primary purpose of the enforcement activity in the WPP is to resolve violations and return the entity to compliance.

Not Applicable [FORMCHECKBOX]: The permittee/facility is not currently under Water Protection Program enforcement action. The most recent inspection was completed by the St. Louis Regional Office on December 11, 2012. The facility was found to be in compliance.

DISCHARGE MONITORING REPORTS:
On July 30, 2013, EPA proposed the Clean Water Act National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, which requires electronic reporting of NPDES information rather than the currently-required paper-based reports from permitted facilities. To comply with the upcoming federal rule, the Department is asking all permittees to begin submitting discharge monitoring data online. For permittees already using the Department's eDMR data reporting system, those permittees will be required to exclusively use the eDMR data reporting system.

[FORMCHECKBOX] - The permittee/facility is not currently using the eDMR data reporting system. To sign up for the eDMR system, visit the Department's eDMR page at [HYPERLINK "http://dnr.mo.gov/env/wpp/edmr.htm"].

EFFLUENT LIMIT GUIDELINES:
The EPA in 2009 published the "Steam Electrical Power Generating Point Source Category: Final Detailed Study Report (2009 Final Report). The 2009 Final Report summarizes data collected and analyzed from the EPA to review discharges from steam electrical power generating industry and to determine whether the current effluent guidelines (ELGs) for this industry should be revised. From the 2009 Final Report, it determined a need existed to update the current effluent regulations specific to Steam Electrical Power Generating Point Sources [40 CFR Part 423]. The 2009 Final Report also concluded the last updated version of this 1982 regulation does not adequately address the pollutants being discharged and has not kept pace with changes that have occurred in the power industry. EPA published a draft rule for comment in 2013. EPA has indicated that it will be finalized in September 2015.

FLUE GAS DESULFURIZATION:
Ameren does not currently use flue gas desulfurization to meet Clean Air requirements at Labadie. If Ameren decides to install scrubbers to meet Clean Air Act requirements, the facility will need to submit an antidegradation request, along with a permit modification to this permit. Flue gas desulfurization can introduce new pollutants of concern into the wastewater streams. The permit modification will reflect the change in flows and the change in water characteristics in the plant. The revised effluent limit guideline EPA is developing is expected to address waste streams associated with air control technologies, including flue gas desulfurization.

GROUNDWATER MONITORING IN CONJUNCTION WITH SOLID WASTE MANAGEMENT PROGRAM
Ameren has started collecting background or baseline water quality data for the proposed Utility Waste Landfill. Ameren will be working with the Missouri Geological Survey to establish wells in the area of the proposed landfill and to develop their statistical package for Solid Waste. Any data collected through the Solid Waste landfill permitting process will be reviewed by the department. Groundwater monitoring under this permit is being established around the existing ash ponds.

GROUNDWATER MONITORING:
A groundwater monitoring plan is required to be developed and implemented to examine potential discharges to groundwater from the existing ash ponds. Ameren- Labadie sampled upgradient of the ash ponds in April 2012 to address concerns by the public about well contamination on the properties closest to Ameren's property line. In this permit renewal, Ameren is being required to work with the Missouri Geological Survey to establish a groundwater monitoring program that characterizes groundwater movement at Labadie and determines the proper location and installation of monitoring wells to fully characterize the ash ponds. Monitoring will occur upgradient and downgradient of the ash ponds in multiple locations. As part of the groundwater characterization plan, the department will work with Ameren on establishing the parameters to be monitored. Parameters for consideration in the development of the monitoring plan may be based on EPA's *Characterization of Coal Combustion Residues from Electric Utilities – Leaching and Characterization Data*, and 40 CFR 257 Appendix I (MCLs for drinking water), Appendix III (Constituents for Detection Monitoring), and Appendix IV (Constituents for Assessment Monitoring, 40 CFR 265 Appendix III (MCLs for drinking water) and Appendix IV (statistical tests), and Solid Waste Management Program's utility waste landfill monitoring requirements. Missouri's utility waste landfill monitoring requirements can be found at 10 CSR 80-11.010, Appendix I.

The groundwater monitoring requirements of this permit are separate and in addition to the requirements established under the Resource Conservation and Recovery Act in 40 CFR 257. These requirements are included in accordance with 10 CSR 20-7.015(7). The additional requirements include the cooperative development of a Detailed Hydrogeologic Site Characterization and long-term Groundwater Monitoring & Sampling Plan (GMSAP). These requirements are intended to be concurrent with, not in replacement of, the requirements of 40 CFR 257. Nothing in this permit prevents the permittee from installing wells and conducting monitoring in the timeline required by 40 CFR 257, nor does the schedule in this permit supersede any deadlines established by 40 CFR 257. The purpose of these additional requirements is to ensure that complex hydrogeological settings are accurately characterized to ensure that the long-term GMSAP is effective for determining compliance with 10 CSR 20-7.015(7) and water quality standards 10 CSR 20-7.031.

Aluminum	Chloride	Lithium	Selenium	Chemical Oxygen Demand
Antimony	Chromium III	Manganese	Silver	Hardness, as $CaCo_3$
Arsenic	Chromium VI	Mercury	Sodium	Specific Conductance
Barium	Cobalt	Molybdenum	Sulfate, as SO_4	Total Dissolved Solids
Beryllium	Copper	Nickel	Sulfide	Total Organic Carbon
Boron	Fluoride	pH	Thallium	Total Organic Halogens
Cadmium	Iron	Radium 226	Zinc	
Calcium	Lead	Radium 228		

INTAKE WATER CREDITS (NET LIMITS):

In accordance with federal regulation 40 CFR 122.45(g), technology-based effluent limitations or standards shall be adjusted to reflect credit for pollutants in the discharge's intake water if: (1) The applicable effluent limitations and standards contained in 40 CFR subchapter N specifically provide that they shall be applied on a net basis; or (2) The discharger demonstrates that the control system it proposes or uses to meet applicable technology-based limitations and standards would, if properly installed and operated, meet the limitations and standards in the absence of pollutants in the intake waters. Additionally, credit for conventional pollutants such as biochemical oxygen demand (BOD) or total suspended solids (TSS) should not be granted unless the permittee demonstrates that the constituents of the generic measure in the effluent are substantially similar to the constituents of the generic measure in the intake water or unless appropriate additional limits are placed on process water pollutants either at the outfall or elsewhere. Credit shall be granted only to the extent necessary to meet the applicable limitation or standard, up to a maximum value equal to the influent value. Additional monitoring may be necessary to determine eligibility for credits and compliance with permit limits. Credit (Net Limits) do not apply to the discharge of raw water clarifier sludge generated from the treatment of intake water.

Applicable [FORMCHECKBOX]: Ameren Labadie employs intake water credits for Outfalls #002 and #009. Outfall #002 is the ash pond which receives water from the Missouri River intake. Net limit and intake water credit applicable to Labadie is total suspended solids. Outfall 009 is the emergency spillway from the ash ponds. See discussion in Appendix B: TBEL determination for additional information on intake water credits.

The majority of the water through Outfall #002 is eligible for the intake credits; however Ameren does receive some water from wells onsite or from stormwater into the ash ponds and ultimate discharge through #002. To account for the water received that is not from the Missouri River, Ameren plans to calculate the required influent flow, "Qr" by multiplying the estimated discharge flow "Qd", based on the water balance diagram in Appendix B by 0.95

$$[(Q_d \times 8.34 \times C_d) - (Q_r \times 8.34 \times C_r)] / (Q_d \times 8.34) = \text{TSS Net in mg/L}$$

Where:
Q_d = Flow from Outfall #002 or #009 (in MGD).
C_d = Concentration in TSS measure in the final effluent from Outfall #002 or #009 (in mg/L);
Q_r = Intake flow (in MGD) that flows to either Outfall #002 or #009
C_r = Intake flow TSS concentration (in mg/L).

REASONABLE POTENTIAL ANALYSIS (RPA):

Federal regulation [40 CFR Part 122.44(d)(1)(i)] requires effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause or contribute to an in-stream excursion above narrative or numeric water quality standard. In accordance with [40 CFR Part 122.44(d)(iii)] if the permit writer determines that any given pollutant has the reasonable potential to cause, or contribute to an in-stream excursion above the WQS, the permit must contain effluent limits for that pollutant. See Appendix D for the comparison of concentrations from Outfall #002, the water quality standard, and the effluent limits based on the water quality standard for this discharge. This permit proposes additional monitoring at Outfall #002 if the revised 40 CFR 423 effluent limit guideline is not finalized within a year of permit issuance. The requirement is to provide enough data points to conduct a reasonable potential analysis or to redo the best technology analysis in Appendix C.

Chlorination for Outfall #001

Chlorination (Free Available and/or Total Recoverable) as established in 40 CFR 423.12 and 423.13 is not applicable to this facility for once through cooling water due to the fact that this facility does not chlorinate. Additionally, WET testing as a schedule condition will not be applied to this facility due to the fact that they do not use pesticides for organisms (e.g., zebra mussels) that obstruct their intake structure. Please see Outfall #001 for a more detailed description of WET testing conditions.

Sulfate for Outfall #002

Previous permit required quarterly sulfate monitoring. Missouri has proposed a new water quality standard for sulfate that is dependent on the stream hardness and on the chloride concentration. Reasonable potential will be reevaluated upon renewal. The permit includes quarterly monitoring for chlorides and stream hardness. Monitoring frequency remains the same.

Metals –Boron for Outfall #002.

In evaluating the expanded test results for Outfall #002 and comparing with the background concentration and the technology based effluent limit determination, monitoring only is being required for this permit. The water quality based standard for boron is 2. 0 mg/L, as the drinking water standard.

Whole Effluent Toxicity Testing – Outfall #002

Staff drafting this operating permit has reviewed the renewal application and other appropriate sources regarding establishing a WET test for Outfall #002. Staff drafting this operating permit has determined that the WET testing conducted on Outfall #002 is a representative sample. Previous permits included the single dilution method, this permit requires the multiple dilution method. See WET test subsection for more information on WET testing.

REMOVAL EFFICIENCY:

Removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to Biochemical Oxygen Demand 5-day (BOD_5) and Total Suspended Solids (TSS) for Publicly Owned Treatment Works (POTWs)/municipals.

Not Applicable [FORMCHECKBOX]: Influent monitoring is not being required to determine percent removal. Outfall #002 and #009 are eligible for Intake Water Credits; please see Intake Water Credit discussion above.

SANITARY SEWER OVERFLOWS (SSO) AND INFLOW AND INFILTRATION (I&I):

Sanitary Sewer Overflows (SSOs) are defined as an untreated or partially treated sewage release are considered bypassing under state regulation [10 CSR 20-2.010(11)] and should not be confused with the federal definition of bypass. SSO's have a variety of causes including blockages, line breaks, and sewer defects that allow excess storm water and ground water to (1) enter and overload the collection system, and (2) overload the treatment facility. Additionally, SSO's can be also be caused by lapses in sewer system operation and maintenance, inadequate sewer design and construction, power failures, and vandalism. SSOs also include overflows out of manholes and onto city streets, sidewalks, and other terrestrial locations. Additionally, Missouri RSMo §644.026.1 mandates that the department require proper maintenance and operation of treatment facilities and sewer systems and proper disposal of residual waste from all such facilities.

Not applicable [FORMCHECKBOX]: This facility is not required to develop or implement a program for maintenance and repair of the collection system; however, it is a violation of Missouri State Environmental Laws and Regulations to allow untreated wastewater to discharge to waters of the state.

SCHEDULE OF COMPLIANCE (SOC):

A schedule of remedial measures included in a permit, including an enforceable sequence of interim requirements (actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit.

Applicable [FORMCHECKBOX]: The time given for effluent limitations of this permit listed under Interim Effluent Limitation and Final Effluent Limitations were established in accordance with [10 CSR 20-7.031(10)].

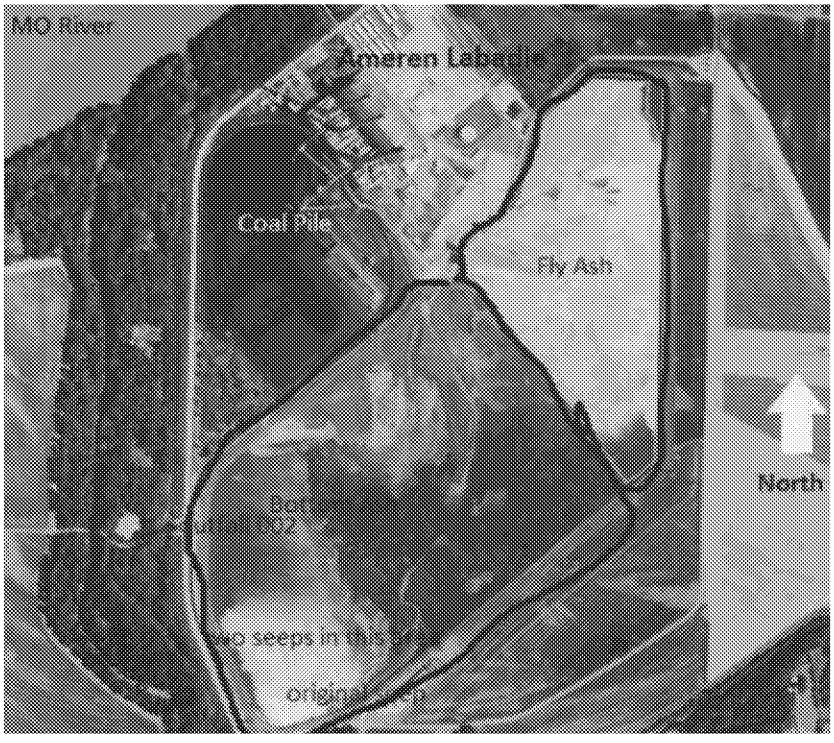
- For Outfall #02A, Labadie has a schedule of compliance for the installation of disinfection equipment as soon as possible, but no later than two years from the effective date of this permit.
- Other schedules of compliance in the permit are for establishment of a groundwater monitoring plan, reestablishment of a biomonitoring program, and for upgrades to the intake structure.
- For more information on the schedules of compliance, please see discussion under groundwater monitoring, 316(a) and 316(b).
    - The timeline for compliance with the thermal effluent limits is to coincide with the requirements under 316(b) to meet entrainment and impingement regulations.
    - The department believes it is impractical to set conflicting schedules of compliance that may force an upgrade without solving the multiple environmental concerns at the facility, when there are multiple studies and evaluations of technologies being required during this permit cycle. Coordination of the 316(a) and 316(b) studies as this permit lays out will facilitate the evaluation of the cumulative effects of the thermal discharge co-occurring with entrainment and impingement of the river's biota.

SEEPS PREVIOUSLY IDENTIFIED IN THE 1992 RENEWAL APPLICATION:

According to Ameren, the original 30 gpm seep reported in the 1992 renewal application at the south corner of the bottom ash pond ceased to exist when Ameren filled the area in due to an anticipated ash reuse project that never materialized in 2008. A small seep in the vicinity of the 24 inch discharge pipe of outfall #002 that travels through the berm wall of the bottom ash pond. To correct and eliminate the seeps, Ameren placed an anti-seep collar around the outfall #002 discharge pipe on the western side of the pond berm to address the seepage occurring below the pipe. The majority of excavation to install the anti-seep collar was dry and the soil above the pipe consisted of clay/sand fill material. Approximately 12 inches of gravel and sand bedding material was encountered below the pipe. This material was found to be saturated and it is likely that the seepage originated from this layer. An approximate seven foot long plug of soil mixed with bentonite was placed below the pipe and used to backfill the excavation above the pipe.

On the southwest portion of the old ash pond, two seeps were occurring, one very small with an unknown discharge rate and the other seep was discharging about 30 gpm, according to Ameren. The effluent from both seeps was discharging to a wetlands area on Ameren property and isolated from the Missouri River except during flood conditions. To eliminate the seeps, a soil-bentonite slurry wall was installed within the berm, along the southwest portion of the old ash pond. The wall was initially designed to be 500 feet in length and 30 feet deep. It was constructed by excavating a bentonite slurry into the trench to prevent caving. The trench was then backfilled with a soil and bentonite mixture. While excavating the trench, a broken rock layer was encountered that continued beyond the planned southern end of the trench. The trench length was extended an additional ninety feet to avoid terminating the slurry wall in the permeable broken rock material.

The picture below was provided by Ameren to show the locations of the seeps, prior to being fixed.



STORM WATER POLLUTION PREVENTION PLAN (SWPPP):

In accordance with 40 CFR 122.44(k) *Best Management Practices (BMPs)* to control or abate the discharge of pollutants when: (1) Authorized under section 304(e) of the Clean Water Act (CWA) for the control of toxic pollutants and hazardous substances from ancillary industrial activities: (2) Authorized under section 402(p) of the CWA for the control of storm water discharges; (3) Numeric effluent limitations are infeasible; or (4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA.

In accordance with the EPA's *Developing Your Stormwater Pollution Prevention Plan, A Guide for Industrial Operators*, (Document number EPA 833-B-09-002) [published by the United States Environmental Protection Agency (USEPA) in February 2009], BMPs are measures or practices used to reduce the amount of pollution entering (regarding this operating permit) waters of the state. BMPs may take the form of a process, activity, or physical structure. Additionally in accordance with the Storm Water Management, a SWPPP is a series of steps and activities to (1) identify sources of pollution or contamination, and (2) select and carry out actions which prevent or control the pollution of storm water discharges.

Applicable [FORMCHECKBOX]: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the department with jurisdiction, incorporate erosion control practices specific to site conditions, and provide for maintenance and adherence to the plan. As Labadie is a large industrial site, in the development of the SWPPP, they may want to use the draft SWPPP template provided by EPA and consult the Industrial Stormwater Fact Sheets developed by EPA ([HYPERLINK "http://cfpub.epa.gov/npdes/stormwater/swsectors.cfm"]) to ensure the SWPPP is as comprehensive as possible. Fact sheets of interest may include the [HYPERLINK "http://www.epa.gov/npdes/pubs/sector_o_steamelectricpower.pdf"], [HYPERLINK "http://www.epa.gov/npdes/pubs/sector_h_coalmines.pdf"] and [HYPERLINK "http://www.epa.gov/npdes/pubs/sector_p_transportationfacilities.pdf"]. The fact sheets provide further references and resources for developing the SWPPP.

- The establishment of daily maximum benchmarks for Outfall #003-#006 is to meet the goals of EPA's memo and provide clear, specific and measurable elements for BMP installation and supports an adaptive management approach to meeting water quality at a large industrial facility, as discussed in EPA's November 26, 2014 Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on those WLAs" Memo.
- Under EPA's Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits, the removal of monitoring requirements from Outfall #007 is based on "If the permitting authority determines that, through implementation of appropriate BMPs required by the NPDES storm water permit, the discharges have the necessary controls to provide for attainment of WQS and any technology-based requirements, additional controls need not be included in the permit"
- The requirement for the SWPPP, BMPs, and the benchmark standards are more protective than numeric stormwater effluent limitations in the current operating permit. While a single exceedance of a daily maximum benchmark may not trigger a violation, it does trigger a mandatory response action and should the exceedance continue result in enforcement action. This permit includes chemical oxygen demand, which the previous permit did not contain. The settleable solids benchmark was reduced from a daily maximum of 2 mg/L to 1.5 mg/L with a trigger if exceeding the 1.5 mg/L.
- Under 10 CSR 20-6.200(2)(B)3, "Facilities which meet the following definitions are considered to be included in this subsection:…D. Steam electric power generating facilities, including coal handling sites." This requirement references back to 10 CSR 20-6.200(2)(A) including immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility. With this requirement, outfalls #007 and #008 were established in previous permits and do not qualify for no exposure. With the BMPs installed on-site and with the exemption in 10 CSR 20-6.200(1)(B)2 for areas located on plant lands separate from the plant's industrial activities, the permit writer's best judgment was to require the outfalls to be covered in the SWPPP, the BMPs be maintained, and that monitoring would be waived this permit cycle.
    - Outfall #007 was removed from monitoring, as it is located at the plant's entrance, is not located near plant operations, has BMPs installed, and in review of the DMR data available is often at the detection level of the test methods.
    - Outfall #007 is still required to be included in the SWPPP and sampled prior to reapplication at renewal. If there is a change in operations that would affect Outfall #007 or the drainage area to #007, benchmarks and monitoring will be reevaluated.
- Outfall #008 under the previous operating permit did not contain monitoring or effluent limits on it.

VARIANCE:
As per the Missouri Clean Water Law § 644.061.4, variances shall be granted for such period of time and under such terms and conditions as shall be specified by the commission in its order. The variance may be extended by affirmative action of the commission. In no event shall the variance be granted for a period of time greater than is reasonably necessary for complying with the Missouri Clean Water Law §§644.006 to 644.141 or any standard, rule or regulation promulgated pursuant to Missouri Clean Water Law §§644.006 to 644.141.

Not Applicable [FORMCHECKBOX]: This operating permit is not drafted under premises of a petition for variance. For the previously issued 316(a) thermal discharge variance discussion, please see 316(a) section below. The 316(a) variance is not being regranted with this renewal.

UTILITY WASTE LANDFILL:
Ameren Labadie submitted their construction permit application to the department's Solid Waste Management Program and to Franklin County for approval. The department received their construction permit application on January 29, 2013 and issued the construction permit January 2, 2015. Ameren also filed with the Public Service Commission requesting permission to build the utility waste landfill. Under the Franklin County Landfill ordinances passed in 2011, Ameren had to submit the application to an independent engineer for review and approval also. Franklin County's planning and zoning ordinances are available online. Article 10, Supplementary Use Regulations, deals with utility waste landfills. ([HYPERLINK "http://www.franklinmo.org/Public%20Works/Planning%20and%20Zoning/Unified_Land_Use/Unified_Land_Use_Regulations.htm"])

Utility waste landfill construction is covered under in 10 CSR80-11, Utility Waste Landfills. Prior to submittal of the construction permit, Ameren worked with the Missouri Geological Survey and Solid Waste Management Program on a detailed site investigation (DSI). The DSI is available on Ameren's website, ([HYPERLINK "http://www.ameren.com/sites/aue/source/AboutUs/Pages/LabadieLandfill.aspx"]).
Ameren has completed three groundwater sampling events at the proposed utility waste landfill. The facility has installed twenty-nine (29) monitoring wells. The proposed landfill will be 167 acres.

In discussions with Ameren, the stormwater retention basins and leachate collection system are not expected to discharge or contribute pollutants during this permit cycle. However, prior to routing flows to a discharge, Ameren may need to submit an antidegradation request and will need to submit a permit modification for the addition of the landfill to the NPDES permit. Ameren's initial plans will include a wastewater collection system and transfer ponds to be constructed to receive stormwater runoff from the landfill cells and leachate collection system. The department will be public notice the modified permit and antidegradation report with the proposed changes.

WASTELOAD ALLOCATIONS (WLA) FOR LIMITS:
As per [10 CSR 20-2.010(78)], the amount of pollutant each discharger is allowed by the department to release into a given stream after the department has determined total amount of pollutant that may be discharged into that stream without endangering its water quality.

Applicable [FORMCHECKBOX]: Wasteload allocations were calculated where applicable using water quality criteria or water quality model results and the dilution equation below:

[EMBED Equation.3] (EPA/505/2-90-001, Section 4.5.5)

Where C = downstream concentration
C_s = upstream concentration
Q_s = upstream flow
C_e = effluent concentration
Q_e = effluent flow

Chronic wasteload allocations were determined using applicable chronic water quality criteria (CCC: criteria continuous concentration) and stream volume of flow at the edge of the mixing zone (MZ). Acute wasteload allocations were determined using applicable water quality criteria (CMC: criteria maximum concentration) and stream volume of flow at the edge of the zone of initial dilution (ZID). Water quality based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's "Technical Support Document For Water Quality-based Toxics Control" (EPA/505/2-90-001).

Number of Samples "n":
Additionally, in accordance with the TSD for water quality-based permitting, effluent quality is determined by the underlying distribution of daily values, which is determined by the Long Term Average (LTA) associated with a particular Wasteload Allocation (WLA) and by the Coefficient of Variation (CV) of the effluent concentrations. Increasing or decreasing the monitoring frequency does not affect this underlying distribution or treatment performance, which should be, at a minimum, be targeted to comply with the values dictated by the WLA. Therefore, it is recommended that the actual planned frequency of monitoring normally be used to determine the value of "n" for calculating the AML. However, in situations where monitoring frequency is once per month or less, a higher value for "n" must be assumed for AML derivation purposes. Thus, the statistical procedure being employed using an assumed number of samples is "n = 4" at a minimum. For Total Ammonia as Nitrogen, "n = 30" is used.

WLA MODELING:
There are two general types of effluent limitations, technology-based effluent limits (TBELs) and water quality based effluent limits (WQBELs). If TBELs do not provide adequate protection for the receiving waters, then WQBEL must be used.

WATER QUALITY STANDARDS:
Per [10 CSR 20-7.031(3)], General Criteria shall be applicable to all waters of the state at all times including mixing zones. Additionally, [40 CFR 122.44(d)(1)] directs the department to establish in each NPDES permit to include conditions to achieve water quality established under Section 303 of the Clean Water Act, including State narrative criteria for water quality.

WHOLE EFFLUENT TOXICITY (WET) TEST:
A WET test is a quantifiable method of determining if a discharge from a facility may be causing toxicity to aquatic life by itself, in combination with or through synergistic responses when mixed with receiving stream water.

Applicable [FORMCHECKBOX]: Under the federal Clean Water Act (CWA) §101(a)(3), requiring WET testing is reasonably appropriate for site-specific Missouri State Operating Permits for discharges to waters of the state issued under the National Pollutant Discharge Elimination System (NPDES). WET testing is also required by 40 CFR 122.44(d)(1). WET testing ensures that the provisions in the 10 CSR 20-6.010(8)(A)7. and the Water Quality Standards 10 CSR 20-7.031(3)(D),(F),(G),(I)2.A & B are being met. Under [10 CSR 20-6.010(8)(A)4], the department may require other terms and conditions that it deems necessary to assure compliance with the Clean Water Act and related regulations of the Missouri Clean Water Commission. In addition the following MCWL apply: §§§644.051.3 requires the department to set permit conditions that comply with the MCWL and CWA; 644.051.4 specifically references toxicity as an item we must consider in writing permits (along with water quality-based effluent limits, pretreatment, etc…); and 644.051.5 is the basic authority to require testing conditions. WET test will be required by all facilities meeting the following criteria:

[FORMCHECKBOX] Facility is a designated Major.
[FORMCHECKBOX] Facility handles large quantities of toxic substances, or substances that are toxic in large amounts.

- Outfall #001 has an unscheduled WET test required when the facility uses a molluscicide or other toxic pollutants to remove organisms from intake structures. If molluscicide is used to removed organisms from the intake structure, an annual WET test is required
- Outfall #002 retains annual WET testing, however instead of grab, single dilution previously required, this permit requires a multiple dilution, grab test.
- Outfall #02A does not have a WET test. A WET test was not established for this outfall, as the flows from the activated sludge plant are routed to go through the ash pond, Outfall #002, prior to discharge. Following the permit manual, this outfall would have a once per permit cycle acute WET test; however Outfall #002 has an annual chronic WET test, which is a more protective monitoring frequency.

40 CFR 122.41(M) - BYPASSES:
The federal Clean Water Act (CWA), Section 402 prohibits wastewater dischargers from "bypassing" untreated or partially treated sewage (wastewater) beyond the headworks. A bypass, which includes blending, is defined as an intentional diversion of waste streams from any portion of a treatment facility, [40 CFR 122.41(m)(1)(i)]. Additionally, Missouri regulation 10 CSR 20-2.010(11) defines a bypass as the diversion of wastewater from any portion of wastewater treatment facility or sewer system to waters of the state. Only under exceptional and specified limitations do the federal regulations allow for a facility to bypass some or all of the flow from its treatment process. Bypasses are prohibited by the CWA unless a permittee can meet all of the criteria listed in 40 CFR 122.41(m)(4)(i)(A), (B), & (C). Any bypasses from this facility are subject to the reporting required in 40 CFR 122.41(l)(6) and per Missouri's Standard Conditions I, Section B, part 2.b. Additionally, Anticipated Bypasses include bypasses from peak flow basins or similar devices designed for peak wet weather flows.

Not Applicable [FORMCHECKBOX] : This facility does not bypass.

303(d) LIST & TOTAL MAXIMUM DAILY LOAD (TMDL):
Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs. A TMDL is a calculation of the maximum amount of a given pollutant that a body of water can absorb before its water quality is affected. If a water body is determined to be impaired as listed on the 303(d) list, then a watershed management plan will be developed that shall include the TMDL calculation

Applicable [FORMCHECKBOX]: The Missouri River is listed on the 2012 Missouri 303(d) List for bacteria.
[FORMCHECKBOX]: This facility is considered to be a source of or has the potential to contribute to the above listed pollutant(s). As parts of this permit renewal, Ameren Labadie is required to install ultraviolet disinfection on Outfall 02A within two years of permit issuance.

TEMPERATURE LIMITS CONSIDERATIONS:

Missouri's Water Quality Standards establish Temperature Criteria that provide several forms of protection from the impacts of heat energy on receiving water bodies. The purpose of the Temperature Limit Guidance is to provide an approach to help both permit writers and the public understand the Temperature Criteria and how temperature requirements are applied in Missouri State Operating Permits. This approach assumes that the receiving water consumes 100% of the heat energy being discharged. At any time the permittee has reason to believe the discharge may exceed their permit temperature limits or if the permittee does exceed their permit limit, the permittee may determine it necessary to take action that may include, but is not limited to, seeking a 316(a) Variance, a Mixing Zone Study, or conducting a "Heat Model". If action is taken by the permittee that warrants a modification to this operating permit, then the permittee will need to submit an application for a permit modification. Submitting an application for permit modification does not guarantee approval of said action and does not directly indicate that the result of said action will be implemented into an operating permit. A Quality Assurance Project Plan (QAPP) must be submitted for any alternative compliance approach.

Ameren Missouri has indicated a preference for retaining effluent limitations in the form of thermal discharge effluent limits (btu/hr) from the previous operating permit for the Labadie Energy Center. They indicate that these limitations are protective of Water Quality Standards on the Missouri River. The original 316(a) demonstration resulted in a 316(a) variance, which was approved in 1977. The 316(a) variance removed the permit schedule of compliance requiring off-stream cooling and applied, instead, alternative heat rejection limits based on power generation. The thermal discharge limits were increased in 1992 from 10.63 $x10^9$ btus/hr to 11.16 x 10^9 btus/hr. The permit retains the 11.16 $x10^9$ btus/hr thermal discharge limit on Outfall #001 as interim effluent limits with a schedule of compliance with the water quality standards 10 years from permit issuance. Besides the schedule of compliance and interim effluent limits, this permit requires the monitoring of the stream and the effluent temperature and flow to be used in conjunction with the studies Ameren will be conducting to establish the appropriate temperature and/or mixing zones for the Labadie Energy Center.

As part of the Technology Based Effluent determination for once-through cooling technology and its thermal discharge, Appendix H was completed which provides the justification on the cost to install a different cooling technology and the impacts a different cooling technology may have on the environment and operations at the facility if Labadie Energy Center was retrofitted for closed-cycle cooling. Conditions in this permit require Ameren to reestablish biological monitoring for determination of aquatic populations present upstream and downstream. Also this permit requires Ameren to conduct studies for impacts due to entrainment, which also requires evaluation of different cooling water intake methods, including closed cycle cooling.

316(a) THERMAL DISCHARGES

Section 316(a) of the Clean Water Act (CWA) applies to point sources with thermal discharges. It authorizes the NPDES permitting authority to impose alternative effluent limitations for the control of the thermal component of a discharge in lieu of the effluent limits that would otherwise be required under section 301 or 306 of the CWA.

Regulations implementing section 316(a) are codified at 40 CFR Part 125, subpart H. These regulations identify the criteria and process for determining whether an alternative effluent limitation (i.e., thermal variance from the otherwise applicable effluent limit) may be included in a permit. This means that before a thermal variance can be granted, 40 CFR Parts 125.72 and 125.73 require the permittee to demonstrate that the protection and propagation of the waterbody's balanced, indigenous population (BIP) of shellfish, fish, and wildlife is being attained.

The burden of proof is on the permittee to demonstrate that it is eligible to receive an alternative thermal effluent limit under section 316(a). This means the permittee must demonstrate to the department that a thermal effluent limit necessary to meet the requirements of sections 301 or 306, specifically 10 CSR 20-7.031(5)(D)1 and 10 CSR 20-7.031(5)(D)5, is more stringent than necessary to assure the protection and propagation of a BIP in and on the body of water into which the discharge is made.

Not Applicable [FORMCHECKBOX]: Ameren Labadie has operated under a thermal variance since 1977 and did request with their permit renewal application in 1998 and in 2011 reissuance of the variance. This permit establishes interim effluent limits with a schedule of compliance to meet the water quality standard, with appropriate mixing considerations in 10 years.

In review of the data available, there was not enough information to determine if the requirements of 40 CFR 125.73(c)(1) were met. 40 C.F.R. § 125.73(c)(1) addresses how existing sources may make a demonstration for a 316(a) variance based on the "absence of prior appreciable harm. Specifically, subpart (c)(1) states that such a demonstration shall show:

(i) That no appreciable harm has resulted from the normal component of the discharge taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge has been made; or
(ii) That despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made."

The term "appreciable harm" is not defined in the regulations; however, the burden of proof is on the permittee to make a demonstration that assures that the BIP will be maintained. The following criteria are indicators of the occurrence of "appreciable harm":

1. Substantial increase in abundance or distribution of any nuisance species or heat-tolerant community not representative of the highest community development achievable in receiving waters of comparable quality.
2. Substantial decrease of formerly indigenous species, other than nuisance species.
3. Changes in community structure to resemble a simpler successional stage than is natural for the locality and season in question.
4. Unaesthetic appearance, odor, or taste of the waters.
5. Elimination of an established or potential economic or recreational use of the waters.
6. Reduction of the successful completion of life cycles of indigenous species, including those of migratory species.
7. Substantial reduction of community heterogeneity or trophic structure.

The department reevaluated the data previously submitted by Ameren from 1980-1985 and 1996-2001, along with data collected by Missouri Department of Conservation and US Fish and Wildlife. Before deciding to regrant the variance, the department discussed the existing studies and data available with Missouri Department of Conservation and EPA on their thoughts and concerns. The data available does not present convincing evidence of greater numbers of fish upstream of the Labadie plant than downstream.

The department has decided not to regrant the 316(a) variance thermal limits, but instead issue **interim effluent limits** as the previous permit's required compliance with a thermal discharge effluent limit, not a temperature effluent limit, consistent with the previously approved 316(a) variance, but not Missouri's Water Quality Standards. In reviewing the previously issued permits for Labadie, the water quality standard of 90°F has never been established as a permit condition. The interim effluent limit is the existing 11.16 $x10^9$ btus/hr thermal discharge limit on Outfall #001 previously granted with the approval of the 316(a) variance; however monitoring is required of the stream and the effluent temperature and flow to be used in conjunction with the biological studies to establish the appropriate temperature and/or mixing zones for the Labadie Energy Center for compliance with Missouri's water quality standards.

This permit requires Ameren to develop a revised sampling plan and to reestablish sampling of aquatic communities to demonstrate there is a balanced indigenous population present and to also begin planning for any appropriate upgrades to meet the thermal effluent limits. The requirement to revise the existing sampling plan is to provide for more updated and different sampling methods, such as trolling. Also the revised sampling plan will require Ameren to evaluate the existing sampling locations, both up and downstream of the plant to ensure the best possible locations are being used for data gathering and that the habitats' up and downstream are similar to ensure the habitats' impact on the river are similar. The revised sampling plan will also need to include sampling procedures for the collection of benthic communities, macro invertebrates, and other aquatic communities of the river.

The age of the studies and the sampling techniques used has brought the claim that Ameren did not identify or determine the species missing from the previous surveys, which would include many uncommon or rare species that may be difficult to catch with the methods used. The assumption that the Missouri River's complete biological indigenous community (BIC) is present in the Missouri River at the Labadie Energy Center is inaccurate. The lower Missouri River and the middle Missouri River have many fish species that utilize large areas and habitat to meet their life cycle needs, including spawning, rearing, feeding, and over-wintering. The habitat surrounding Labadie may support different fish species with year-round residency, a season migration route, or no support at all because of naturally limiting features such as flow velocity, depth, substrate, ambient temperature, cover, or the absence of forage.

In evaluating ecological communities, a species-accumulation curve is used to depict the increasing number of species recorded in a specific environment as a function of the cumulative sampling effort. This effort applies in defining the BIC based on comparing the catch at differing locations that may have similar species composition but different effective sampling efforts. Comparing total counts and individual species caught and identified by the different studies and surveys on the lower rivers can be misleading because of the differing vulnerability of species to the various sampling gear types and configurations, the level of the sampling effort, the time of sampling and the different habitat features sampled. In EPA's draft 316(a) guidance, EPA recognized the difficulty of evaluating the entire community and all member species and the solution EPA established was the Representative Important Species (RIS) with the assumption that if the RIS are doing well, the entire biological community should be as well.

Cumulative impacts of the Labadie thermal discharge will be addressed in the next permit renewal. Among potential cumulative stressors, the analysis would include synergistic effects between temperature and water or sediment contaminants, other heat sources, habitat modifications and altered annual flow regimes. Habitat modifications and altered flow regimes have been previously identified as constraints to recovery of native species. EPA's definition of BIC recognizes that the presence or absence of some species may reflect man-induced changes in the system; which for the lower Missouri River would include damming of the upper river reaches, the effects of flow regulations, channelization, reductions in off-channel areas, islands, floodplain inundation, turbidity, silt load, and increased velocity. Coordination of the 316(a) and 316(b) studies as this permit lays out will facilitate the evaluation of the cumulative effects of the thermal discharge co-occurring with entrainment and impingement of the river's biota.

History of the 316(a) Variance at Labadie:

- Original permit issued in October 3, 1975 with temperature limit of 118°F, along with a schedule of compliance for off stream cooling by July 1, 1981. Ameren had applied for a 316(a) variance at that time and was in process of completing the study.
- Ameren conducted thermal plume studies from 1974 through 1979. Biological monitoring was completed during 1974-1975 for the 316(a) variance request.
- The permit, which established the alternate limit of 10.63 $x10^9$ btus/hr as an effluent limit and the 316(a) variance was issued July 15, 1977, following public notice March 11-April 11, 1977. The 316(a) waiver was recommended for approval by EPA on February 14, 1977. Along with the alterative effluent limit, the temperature requirement of 118° F and the special condition requiring off stream cooling was removed.
- Ameren applied for reapplication in 1980 and in 1982, with the request to retain the 316(a) variance and thermal effluent limits. Permit was reissued July 30, 1982.
- Ameren conducted additional biological monitoring upstream and downstream of the thermal discharge from 1980 through 1985.
- Permit renewed August 28, 1987 and had applied for reapplication with the request to retain the 316(a) variance and thermal effluent limits.
- With the 1992 permit renewal application, Ameren resubmitted thermal plume study information along with comparison of biomonitoring data collected by Ameren and the Missouri Department of Conservation. Ameren requested the continuation of the alternative thermal discharge effluent limits at all four plants operating at capacity. The permit was public noticed in 1993 and renewed April 1994 with a higher thermal discharge effluent limit, 11.16 $x10^9$ btus/hr.

- Ameren commented on September 29, 1992 regarding the change in thermal discharge limits. The original thermal discharge limits were based on gross electrical generation and manufacturers' design efficiencies. Ameren conducted an examination of the process and refined the calculation to more accurately reflect thermal releases, by accounting for normal turbine efficiency degradation that has always been present, but not included in the original computation. The department agreed with Ameren that the increase from 10.63 x 10^9 to 11.16 x 10^9 btus/hr was only a reporting adjustment and represented no additional heat output. Ameren stated that the heat output has been within 3% for the past 17 years (1975-1992) and would not significantly increase. Ameren submitted the Labadie Thermal Plume and Applicability of Section 316(a) with their comments.
- Ameren conducted additional biomonitoring studies from 1996 through 2001.
- Ameren applied for renewal in 1998 with the permit being public noticed in 1999; however the permit was not reissued.
- The department requested a revised, updated permit application in April 2011. With the revised permit application, Ameren requested the continuation of their thermal discharge limits and 316(a) variance. Data provided by Ameren, along with data from Missouri Department of Conservation and US Fish and Wildlife was compared. This permit regrants the variance as operating capacity has not significantly changed since 1977 and additional studies have not been completed.
- As part of this permit, Ameren is being required to establish a biomonitoring plan, using up to date sampling methods and techniques to verify the impacts on the aquatic communities.

If during the cycle of this operating permit, it is determined that the **interim effluent limits** need modified, the permit contains language indicating that the permit can be reopened and modified, or alternatively revoked and reissued to: incorporate new or modified requirements applicable to implementing a revised department approved 316(a) Variance. The ten year schedule of compliance with the thermal effluent limits is to coincide with the requirements under 316(b) to meet entrainment and impingement regulations. The department believes it is impractical to set conflicting schedules of compliance that may force an upgrade without solving the multiple environmental concerns at the facility, when there are multiple studies and evaluations of technologies being required during this permit cycle.

SUMMARY OF US FISH AND WILDLIFE DATA,
by John Ford, Environmental Specialist IV, Watershed Protection Section

Upon the department's request, US Fish and Wildlife provided data on the lower Missouri River. This data was reviewed to see if there was evidence that the Labadie Energy Center was adversely affecting fish communities (number of fish species and number of individual fish) in a twenty mile segment of the Missouri River bracketing the Labadie plant. Almost none of the over 1,300 net sets appeared to be taken on the right descending bank of the river in the immediate vicinity of the power plant discharge. Thus, this data provides information on fish density and species richness in this 20 mile segment of the river but is not adequate to address questions of the fish community in the immediate vicinity (1 -2 miles) of the Labadie discharge which is at River Mile 57.6.

Table One shows the number of fish species collected in four types of sampling gear. The unadjusted data shows the actual number of species taken and the adjusted data normalizes the numbers of species to the same number of net sets (10) for each type of gear. This was done because different sections of the river received differing numbers of nets sets for given sampling dates and species collected is a logarithmic function of number of net sets. Yellow highlighted cells indicate the lowest species richness for that type of gear, while blue cells indicate the highest species richness. Overall six of the highest eight totals (three adjusted and three unadjusted) species richness values were in sections of the river upstream of the Labadie Energy Center and two (one adjusted, one unadjusted) were downstream. Three of the eight poorest species richness values were upstream of the Labadie Plant (one adjusted, two unadjusted) and five were downstream (3 adjusted, 2 unadjusted). This suggests slightly higher species richness upstream of Labadie.

Table 1. No. of Fish Taxa Collected 2003-2011 USFWS.

Gear		Habitat	Upstream of Labadie PP			Downstream of Labadie	
			River Mile				
			65-70	60-65	57.6-60	54-57	48-54
Unadjusted	Mini Fyke	Bars	10.5	15.3		14	14.5
Adjusted	Mini Fyke	Bars	14	16.1		15.5	13.6
Unadjusted	POT	Bars	12.4		8		10.9
Adjusted	POT	Bars	14.1		10.5		13.9
Unadjusted	Otter	Ch. Border	8.6		10.8	8.5	9.2
Adjusted	Otter	Ch. Border	10.3		10.3	10.6	9.7
Unadjusted	Trammel	Ch. Border	4.6		5	4	6
Adjusted	Trammel	Ch. Border	5.9		5.8	5.6	5.75

Adjusted number of species data was lumped into two location categories, above and below Labadie Energy Center, and examined statistically for each of the four gear types shown in Table One. An Anderson-Darling test for normality was first applied to the data. Most data sets appeared to be normal or nearly so. For those data sets a two-sample t test was used.

Demonstration of 316(a) Thermal Variance (continued):

When one or both data sets did not appear to be normal, either a t test on log transformed data or a non-parametric Mann Whitney median test was applied. Results of these statistical tests are shown below in Table Two.

These tests indicate that only the Mann Whitney test on Mini Fyke net data reaches the 50 percent confidence level for deciding that there is greater species richness upstream of the Labadie plant. None of the tests rise to the level of even 60 percent confidence, and for most, the level of confidence is less than 30 percent. Thus, this fish species richness data does not present convincing evidence of greater species richness upstream of the Labadie Energy Center.

Table 2 Statistical Test Results for Species Richness Above vs. Below Labadie

Results of "t" tests

Gear	Location	Test	Ln Trans?	Mean	T	Prob >t
Mini Fyke	Above	t	N	14.93		
	Below			14.03	0.51	0.624
POT	Above	t	N	13.81		
	Below			13.94	-0.11	0.916
POT	Above	t	Y	2.601		
	Below			2.616	-0.18	0.863
Otter	Above	t	N	9.12		
	Below			9.04	0.07	0.944

Results of Mann Whitney Test

Gear	Location	Test	Ln Trans?	Median	W	Prob >t
Mini Fyke	Above	MW	N	16.28		
	Below			13.91	50.5	0.465
Otter	Above	MW	N	9		
	Below			9	650.5	1
Trammel	Above	MW	N	5.59		
	Below			5.95	141	0.716

Summary data on total number of fish collected is presented in Table 3 below. For five of the six gear types, the largest average number of fish collected was upstream of Labadie and for three of the six gear types; the lowest average number of fish collected was upstream of the Labadie plant.

Demonstration of 316(a) Thermal Variance (continued):

Table 3. Average Number of Fish Collected Per Net Set (No. of Net Sets)

River Mi.	Gear Type						
	Bag	Beam	Hoop	MiniFyke	Otter	POT	Trammel
65-70	27.7 (3)	10.8 (4)	1.5 (13)	20.4 (25)	27.5 (154)	39.0 (123)	6.1 (30)
60-65	58.4 (5)		4.7 (7)	70.7 (12)	58.5 (25)	17.5 (2)	4.4 (29)
57.6-60				18.1 (16)	9.8 (55)	13.2 (6)	3.6 (24)
54-57				59.6 (8)	14.8 (32)		5.5 (50)
48-54	17.6 (14)		5.2 (14)	43.1 (31)	30.8 (69)	1.0 (2)	4.6 (69)
47-48				22.8 (22)	21.5 (132)	31.4 (85)	3.4 (40)

Data for average number of fish collected per net set were lumped into two locations, above and below the Labadie Energy Center for each of four gear types. Data sets were tested for normality using the Anderson Darling test. None of the data sets were normally distributed but log transformation resulted in normal distributions for Mini Fyke and Otter nets which were evaluated with the two-sample t test. POT and Trammel net data were evaluated with the Mann Whitney test for medians. Test results are shown in Table Four and none of these four gear types suggests greater numbers of fish upstream of Labadie at even the 50 percent confidence level. Thus this data does not present convincing evidence of greater numbers of fish upstream of the Labadie plant than downstream.

Table 4 Statistical Test Results for No. of Fish/Net Set Above vs. Below Labadie

Results of "t" tests

Gear	Location	Test	Ln Trans?	Mean	t	Prob >t
Mini Fyke	Above	t	Y	3.05		
	Below			3.37	-0.9	0.386
Otter	Above	t	Y	2.73		
	Below			2.69	0.18	0.86

Results of Mann Whitney Test

Gear	Location	Test	Ln Trans?	Median	W	Prob >t
POT	Above	MW	N	16.38		
	Below			21.5	283	0.63
Trammel	Above	MW	N	3.875		
	Below			4	154.5	0.775

Summary of Biomonitoring Data submitted by Ameren

Ameren previously conducted monitoring of fish upstream and downstream of the power plant. The original studies were completed in 1974 and 1975 at the beginning of operations of the plant. Following the original granting of the 316(a) variance, Ameren conducted monitoring upstream and downstream of the plant from 1980-1985 seasonally. In 1996 through 2001, Ameren resumed monitoring up and downstream of the plant. The data below is a summary of number of fish caught. The 1996-2001 data shows the emergence of carp into the Missouri River.

In discussions with Missouri Department of Conservation on why fish may appear in one sampling set but not in the other, this may be due to the time of sampling event occurred and the sampling method used. While the data sets are similar in fish quantity, the number of collection events varied. The 1980-1985 data collection set is the most frequent.

TABLE 5: COMPARISON OF BIOLOGICAL MONITORING EVENTS AT LABADIE ENERGY CENTER

	1996-2001		1980-1985		1974-1975	
Species	Total Collected	%	Total Collected	%	Total Collected	%
american eel			7	0.2		
bighead carp					1	<0.1
bigmouth buffalo	15	0.4	9	0.3		
black buffalo	5	0.1	4	0.1		
black bullhead					4	0.2
black crappie	1	<0.1	10	0.3		
blue catfish	123	3.3	54	1.7	15	0.7
blue sucker	11	0.3	2	0.1		
bluegill	6	0.2	10	0.3	7	0.3
brook silversides			24	0.6		
bullhead					1	<0.1
catfish					9	0.4
channel catfish	163	4.4	68	2.1	14	0.7
chestnut lamprey	8	0.2	47	1.5	11	0.5
common carp	445	12	120	3.7	4	0.2
flathead catfish	83	2.2	73	2.3	21	1
freckled madtom						
Freshwater drum	170	4.6	275	8.5	289	13.7
Gizzard shad	1919	51.8	1863	57.9	1719	81.2
golden redhorse	1	<0.1	4	0.1		
goldeye	101	2.7	160	5		
grass carp	8	0.2	1	<0.1		
green sunfish	1	<0.1	2	0.1		
largemouth bass	4	0.1	5	0.2		
longear sunfish	1	<0.1	2	0.1		
longnose gar	36	1	40	1.2	1	<0.1
mimic shiner					1	<0.1
minnows					2	<0.1
mooneye	1	<0.1	9	0.3		
northern redhorse					2	<0.1
paddlefish	2	0.1	1	<0.1		
quillback	6	0.2	3	0.1		
red shiner	2	0.1				
river carpsucker	249	6.7	191	5.9	2	<0.1
rock bass			1	<0.1	3	0.1
sauger	2	0.1	7	0.2		
shorthead redhorse	2	0.1	6	0.2		
shortnose gar	114	3.1	121	3.8		
shovelnose sturgeon	1	<0.1	2	0.1		
silver carp	7	0.2				
skipjack herring	4	0.1	6	0.2		
smallmouth bass			3	0.1		
smallmouth buffalo	110	3	23	0.7		
speckled chub						
spotted bass	2	0.1	4	0.1		
stonecat					1	<0.1
striped bass	1	<0.1	2	0.1	2	<0.1
walleye			5	0.2		
white bass	51	1.4	60	1.9	3	0.1
white carppie	1	<0.1	18	0.6	5	0.2
white sucker	3	0.1	1	<0.1		
whiteXstriped hybrid	24	0.6				
Total:	3683	99.4	3243	100.8	2117	99.3

316(b) COOLING WATER INTAKE STRUCTURE

Section 316(b) of the Clean Water Act (CWA) applies to new or existing facilities operating a cooling water intake structure (CWIS). Section 316(b) requires that location, design, construction, and capacity of CWISs reflect the best technology available (BTA) for minimizing adverse environmental impacts (AEI). Under current regulations, existing facilities are subject to section 316(b) conditions that reflect BTA for minimizing AEI on a case-by-case, best professional judgment (BPJ) basis.

The Environmental Protection Agency's (EPA) Phase II Section 316(b) Existing Facilities Rule was remanded to the EPA in *Riverkeeper, Inc, et al. v EPA 475 F.3d 83* (2d Cir. 2007). The Federal Water Pollution Control Act Amendments of 1972 require cooling water intake structures to reflect the best technology available for minimizing adverse environmental impact. Best technology available must consider intake design, location, construction, and capacity. The EPA has finalized the 316(b) standards and they became effective on October 16, 2014 ([HYPERLINK "http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/index.cfm"]).

The Ameren Labadie Energy Center is located on the south bank of the Missouri River at river mile 57.5. The intake structure is located directly on the bank of the river. The main channel and greatest depth of the river occur immediately offshore of the intake structure. The Labadie Energy Center is equipped with one intake structure with eight bays. A trashrack with 2.5-inch opening and a mechanical rake is utilized to reduce debris loading to the traveling screens. Each intake bay contains a circulating water pump, trash rack and vertical traveling screen. All of the screens are flow through and have mesh panels with ½ -inch square openings. The screens are operated as dictated by river and operational conditions. The screens are operated more frequently when there are large amounts of debris or ice present. As the screens are rotated, high pressure nozzles spray water through the back of the screens, and into a trough which returns the backwash water along with any debris and/or impinged organisms back to the river.

The original CWA 316(b) demonstration for Labadie Energy Center was approved by the department by letter dated August 8, 1977 as "Best Technology Available". The report concluded that the estimated annual number of fish lost to impingement had no impact on the ecology or sport fishery of the Missouri River with respect to maintaining a balanced indigenous fish population. One reason for the relatively low numbers of fish collected during the impingement study was the location of the plant intake structure (i.e., main channel). This area of the river is characterized by swift current and shifting substratum which does not present a preferred fish habitat.

An impingement study was conducted in 2005 along with a biological characterization study conducted in 2005/2006. The biological characterization study was to provide a description of the abundance and temporal and spatial characterization of the community potentially vulnerable to impingement. Historical studies conducted between 1974 and 1975 concluded the intake structures did not have significant adverse environmental impacts and that the structures met the requirements of Section 316(b). Because the intake structure equipment and operation are essentially the same as the time of the original study, Ameren believes that the conclusion of the 1970s study is still valid.

While the previously remanded 316(b) rules required the impingement data collection first, this rule identifies seven technologies that Ameren will have to pick from for impingement, after Ameren has completed the required studies below for entrainment. The 2005 data collected was for impingement, which does provide information but may not answer the questions regarding entrainment. Following the completion of the entrainment studies, identifying the impingement technology, installation of technologies, there may be an optimization period requiring additional impingement and entrainment studies at Labadie.

EPA consulted with the US Fish and Wildlife Service and the National Marine Fisheries Service under the Endangered Species Act rules. The Services concluded that the new 316(b) rule is not likely to jeopardize the continued existence of listed species or result in adverse modification of designated critical habitat. However the Services added a number of conditions to the final rule. The rule requires that facilities identify all Federally-listed threatened and endangered species and designated critical habitat that are present in the zone of influence area of the intake. This condition includes all listed species not just fish and shellfish. Additional control measures, monitoring and reporting requirements may be established to minimize incidental take. The Services will have 60 days to review and comment on measures related to listed species and critical habitat.

Appendix H was completed to provide the Technology Based Effluent determination factors for once-through cooling and its thermal discharges. Appendix H details the cost to install a different cooling technology and the impacts a different cooling technology may have on the environment and operations at the facility if Labadie Energy Center was retrofitted for closed-cycle cooling.

The operating permit contains language indicating that the permit may be reopened and modified, or alternatively revoked and reissued to: incorporate new or modified requirements applicable to existing cooling water intake structures under Section 316(b) of the Clean Water Act consistent with any standard established pursuant to section 1311 or section 1316 of 33 USC 1326. In the event that, it is necessary for this permit to be reopened and modified, or alternatively revoked and reissued, permittee shall comply with any such new or modified requirements or standards applicable to existing cooling water intake structures under 316(b) of the Clean Water Act.

To meet the 316(b) requirements, Labadie will be required to meet one of the identified impingement BTA technologies, however as Labadie withdraws more than 125 MGD for cooling water needs, will also need to address entrainment. The implementation of impingement technology is delayed until the required entrainment studies are complete. The required studies include:

i. **Source Water Physical Data Report : 40 CFR 122.21(r)(2)** This report requires a description and scaled drawings showing the physical configuration of the water body, including areal dimensions, depths, and temperature regimes, identification and characterization of the source waterbody's hydrological and geomorphological features, estimate the intake's area of influence within the waterbody and locational maps.

ii. **Cooling Water Intake Structure Data Report, 40 CFR 122.21(r)(3):** This report requires information on the design of the intake structure and its location in the water column. It includes design intake flows, daily hours of operation, number of days of the year in operation and seasonal changes, if applicable; a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges, and engineering drawings of the cooling water intake structure.

iii. **Source Water Baseline Biological Characterization Data Report, 40 CFR 122.21(r)(4):** This report characterizes the biological community in the vicinity of the cooling water intake structure.

iv. **Cooling Water System Data Report, 40 CFR 122.21(r)(5):** This report provides information on the operation of the cooling water system including descriptions of reductions in water withdrawals, recycled water, proportion of the source waterbody withdrawn.

v. **Chosen Method of Compliance with Impingement Mortality Standard, 40 CFR 122.21(r)(6).** Ameren must identify their chosen compliance method and if applicant chooses to comply with a technology option that requires the Impingement Technology Optimization Study , the study must be submitted.

vi. **Performance Studies, 40 CFR 122.21(r)(7):** This rule section requires a summary of biological survival studies conducted at the facility and a summary of any conclusions or results, including; site-specific studies addressing technology efficacy, entrainment survival, and other impingement and entrainment mortality studies. If using data more than 10 years old, applicant must explain why the data is still relevant and representative.

vii. **Operational Status, 40 CFR 122.21(r)(8):** The operational status report includes descriptions of each unit's operating status including age of the unit, capacity utilization for the previous 5 years, and any major upgrades completed within the last 15 years, including boiler replacement, condenser replacement, turbine replacement, and fuel change.

viii. **Entrainment Characterization Study, 40 CFR 122.21(r)(9)**:Facilities that withdraw **125 MGD** or more must develop for submission to the Director that includes 2 years of entrainment data. Entrainment Data Collection Method must identify and document the data collection period and frequency; identify all organisms collected to lowest taxon possible of all life stages of fish that are in the vicinity of the intake structure; identify threatened or endangered species, identify and document how the location of the intake structure in the waterbody are accounted for in data collection. The Biological Entrainment Characterization must describe all life stages including a description of their abundance and their temporal and spatial characteristics in the vicinity of the intake structure, based on sufficient data to characterize annual, seasonal, and diel variation in entrainment including variations related to climate, weather difference, feeding, and water column migration; may include historical data that is representative of the current operation of the facility; identification of all life stages of fish must represent both motile and non-motile life stages Analysis and Support Documentation of current entrainment of all life stages, may include historical data that is representative of current operation of the facility and of biological conditions at the site. Data to support the calculations must be collected during period of representative operational flows and flows associated with data collection must be documented. The method for determining latent mortality along with specific organism mortality or survival must be identified; the facility must identify and document all assumptions and calculation to determine total entrainment, along with all methods and QA/QC procedures.

ix. **Comprehensive Technical Feasibility and Cost Evaluation Study, 40 CFR 122.21(r)(10):** Facilities that withdraw **125 MGD** or more must develop for submission an engineering study of the technical feasibility and costs of entrainment technology options. Technical Feasibility must include closed cycle recirculation discussion, fine mesh screens with mesh size of 2 mm or smaller, water resuse or alternate sources of cooling water; description of all technologies and operational measures considered; land availability, including evaluation of adjacent and and acres potentially available due to generating unit retirements, potential repurposing of areas devoted to ponds, coal piles, rail yrs, transmission yards, and parking lots; discussion of available sources of process water, grey water, wastewater, reclaimed water or other waters of appropriate quantity and quality; and documentation of factors other than cost that may make a candidate technology impractical or infeasible. The cost evaluations must include estimates for all technologies considered; must be adjusted to estimate social costs; all costs must be represented in net present value and annual value; cost clearly labeled as compliance or social costs; separately discuss facility level costs and social costs; compliance costs are calculated after-tax, include administrative costs, permit costs, any outages, downtime; and social costs adjustment includes Director's administrative cost.

x. **Benefits Valuation Study, 40 CFR 122.21(r)(11):** Facilities that withdraw **125 MGD** or more must develop for submission to the Director, an evaluation of the entrainment technology and operational measure benefits. Each category of benefit must be described narratively and benefits should be quantified in physical or biological units and monetized using appropriate economic valuation methods. Must use the Entrainment Characterization Study. Benefit Valuation Study must include: incremental changes in number of individual fish lost due to impingement mortality and entrainment for all life stages; description of basis for any estimates of changes in the stock size or harvest levels of commercial and recreational fish; description of basis for any monetized values assigned to changes in the stock size of commercial and recreational fish, and to any other ecosystem or non-use benefits; discussion of mitigation efforts completed before October 2014; discussion with quantification and monetization, where possible any other benefits expected to accrue, including improvements for mammals, birds, other organisms and aquatic habitats; and discussion of benefits expected to result from reductions in thermal discharges from entrainment technologies (closed-cycle cooling).

xi. **Non-Water Quality Impacts Assessment, 40 CFR 122.21(r)(12):** Facilities that withdraw **125 MGD** or more must develop for submission to the Director a detailed site-specific discussion of changes in non-water quality environmental and other impacts attributed to each technology and operational measure, both increases and decreases. Must include discussion of estimate in change in energy consumption, estimate of air pollutant emissions and of human health environmental impacts, estimates in change in noise, discussion of impacts to safety, including potential plumes, icing and availability of emergency cooling water, discussion of facility reliability, impacts to production based on process unit, reliability due to cooling water availability; significant changes in consumption of water, including comparison of evaporative losses of both once through and closed cycle recirculation, documentation of impacts attributable to changes in water consumption, and discussion of all attempts to mitigate each of these factors.

xii. Additional measures to protect federally listed threatened and endangered species and designated critical habitat, 40 CFR 125.94(g). The Director may establish additional permit control measures, monitoring requirements, reporting requirements than the minimum established to minimize incidental take, reduce or remove detrimental effects, or such control measures may include measures identified by the US Fish and Wildlife Field Office during their 60 day review. When the Director requires additional measures for federally listed species, monitoring is required, 40 CFR 125. 96(g) and may require additional studies and monitoring if threatened or endangered species identified in the vicinity of the intake, 40 CFR 125.98(d).

xiii. **Peer Review, 40 CFR 122.21(r)(13):** The Non-Water Quality Impacts Assessment, Benefits Valuation Study, and Comprehensive Technical Feasibility and Cost Evaluation Study require peer review. Facility must submit the studies for external peer review. Facility selects the peer reviewers and must notify the Department in advance of the peer review. The Director can disapprove a peer reviewer or require additional peer reviewers. The Director may confer with EPA, US Fish and Wildlife, MDC, and PSC to determine which peer review comments must be addressed. Ameren must provide an explanation for any significant reviewer comment not accepted.

316(B) ANNUAL REPORT

The annual report required to be submitted on February 28 every year needs to include a progress report with on the components listed above, along with copies of all data collected in the previous year. This will provide the Department, EPA, and the Services the ability to look at the data more quickly than waiting until four and half years into the process before a decision is made. The first annual report in 2016 should identify the planned peer reviewers.

316(b) Cooling Water Intake Structure (continued):

TABLE 6: COMPARISON OF IMPINGEMENT STUDIES AT LABADIE ENERGY CENTER

Species	2005-2006		1974-1975	
	Total Collected	%	Total Collected	%
Bass			1	<0.1
blue catfish	140	2	15	0.7
blue sucker	2	<0.1		
Bluegill	28	0.4	7	0.3
brook silversides				
Bullhead			1	<0.1
bullhead minnow	1	<0.1		
Carpsuckers	1	<0.1		
Catfish			9	0.4
channel catfish	119	1.7	14	0.7
chestnut lamprey			11	0.5
common carp	17	0.2	4	0.2
emerald shiner	5	<0.1		
flathead catfish	76	1.1	21	1
freckled madtom	3	<0.1		
Freshwater drum	2,003	28.7	289	13.7
Gizzard shad	4,459	64	1,719	81.2
golden redhorse	6	<0.1		
Goldeye	28	0.4		
Goldfish	1	<0.1		
green sunfish	5	<0.1		
lake sturgeon	9	0.1		
largemouth bass	2	<0.1		
longnose gar			1	<0.1
mimic shiner			1	<0.1
Minnows	1	<0.1	2	<0.1
Mooneye	2	<0.1		
northern redhorse			2	<0.1
Quillback	3	<0.1		
red shiner	4	<0.1		
redfin shiner	4	<0.1		
river carpsucker	1	<0.1	2	<0.1
rock bass	3	<0.1	3	<0.1
Sauger	2	<0.1		
shorthead redhorse	5	<0.1		
shovelnose sturgeon	11	0.2		
silver carp	5	<0.1		
skipjack herring	10	0.1		
speckled chub	1	<0.1		
Stonecat			1	<0.1
stonecat madtom	7	0.1		
striped bass			2	<0.1
sturgeon chub	1	<0.1		
Warmouth	1	<0.1		
white bass	3	<0.1	3	0.1
white crappie	1	<0.1	5	0.2
Total:	6,970		2,113	

Part V – Effluent Limits Determination

Outfall #001 – Non-contact Cooling Water

EFFLUENT LIMITATIONS TABLE:

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
FLOW (EFFLUENT)	CFS	1	*		*	YES	MGD TO CFS
INTERIM TEMPERATURE (EFFLUENT)	°F	3,9	*		*	YES	MONTHLY AVERAGE *
FINAL TEMPERATURE (EFFLUENT)	°F	3,9	90		*	YES	*
INTERIM DELTA TEMPERATURE (ΔT)	°F	2,3	*		*	YES	**
FINAL DELTA TEMPERATURE (ΔT)	°F	2,3	±5		*	YES	**
INTERIM THERMAL DISCHARGE LIMIT	BTUS/HR	2,8	11.16×10^9		*	NO	
WHOLE EFFLUENT TOXICITY (WET) TEST	TUc	11	Please see WET Test in the Derivation and Discussion Section below.			YES	%SURVIVAL
MONITORING FREQUENCY	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.						

* - Monitoring requirement only.
** - Parameter was not established in the previous state operating permit.

Basis for Limitations Codes:
1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Ammonia Policy
7. Antidegradation Policy
8. Water Quality Model
9. Best Professional Judgment
10. WET Test Policy

OUTFALL #001– DERIVATION AND DISCUSSION OF LIMITS:

- **Flow (Effluent)**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification. This change was implemented to make ease calculations using flow measurements.

- **Temperature (Effluent)**. Daily monitoring only requirement in °F. Temperature (Effluent) is the measured temperature of the discharge and is not the measured difference between the intake temperature and the discharge temperature. This renewal establishes a 10 year schedule of compliance to meet the final effluent limit of 90°F. The final limit will be established in the next renewal unless a 316(a) variance request is received and approved that supports an alternative limit.

- **Delta Temperature (ΔT)**. Facility is covered under a 316(a) variance for both compliance with the state temperature standard and for the change in temperature. Previous permits tracking of the change in temperature were not monitoring condition of the permit, instead were a reporting condition. This permit requires Ameren to monitor the change in temperature, in accordance with [10 CSR 20-7.031(5)(D)1.]. This renewal establishes a 10 year schedule of compliance to meet the final effluent limit of 90°F. The final limit will be established in the next renewal unless a 316(a) variance request is received and approved that supports an alternative limit.

  ΔT is calculated as follows: $\Delta T = [((Q_s/4)T_s + Q_eT_e) / ((Q_s/4) + Q_e)] - T_s$

  Where,
  $Q_s/4$= is the receiving stream flow in cfs divided by 4 or the flow represented in the cross-sectional area of the receiving stream divided by 4 in accordance with [10 CSR 20-7.031(5)(D)6.]
  Q_e = Effluent Flow.
  T_s = Receiving stream's ambient temperature. A facility's intake temperature can be used for this parameter if the facility believes that it is representative of the receiving stream's actual temperature.
  T_e = Temperature of the Effluent.

- **Thermal Discharge Effluent Limits**. Ameren was granted a 316(a) variance in 1977 by the department. With the granting of the variance, alternative effluent limits were developed to track compliance. The alternative effluent limits are btus/hr. In the 1992 permit, Ameren received the increase in btus/hr allowed to discharge, based on the Labadie Thermal Plume and Applicability of Section 316(a) Report that was submitted with their comment letter in 1992. The changes from 10.63×10^9 btus/hr to 11.16×10^9 btus/hr was based on refinement of the calculation and to account for normal turbine degradation, see 316(a) discussion above. The department is regranting the alternative effluent limits of 11.16×10^9 btus/hr as interim effluent limits with a schedule of compliance.

- **WET Test**. Unscheduled WET test. WET Testing schedules and intervals are established in accordance with the department's Permit Manual; Section 5.2 *Effluent Limits / WET Testing for Compliance Bio-monitoring.* It is recommended that WET testing be conducted during the period of lowest stream flow.
  [FORMCHECKBOX] Chronic
  [FORMCHECKBOX] No less than **ONCE/YEAR:**
  [FORMCHECKBOX] Facility is designated as a Major facility or has a design flow ≥ 1.0 MGD.

Acute AEC% = $((\text{design flow}_{cfs} + ZID_{7Q10}) / \text{design flow}_{cfs})^{-1}] \times 100 = \#\#\%$
Acute AEC% = $((2213.4 + 1379) / 2213.4)^{-1}] \times 100 = 61.6\%$ rounded up to 62%

- **Minimum Sampling and Reporting Frequency Requirements**. Sampling and reporting frequency requirements have been retained from previous state operating permit.

Permitted Feature #010– Intake Cooling Water

EFFLUENT LIMITATIONS TABLE:

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
STREAM FLOW	CFS	2,3	*		*	YES	**
INTAKE FLOW	CFS	2,3	*		*	YES	**
TEMPERATURE (INFLUENT)	°F	3,9	*		*	YES	MONTHLY AVERAGE *
TSS (INTAKE)	MG/L	1,9	*		*	NO	
HARDNESS AS $CaCO_3$	mg/L	2,9	*		*	YES	**
MONITORING FREQUENCY	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.						

* - Monitoring requirement only.
** - Parameter was not established in the previous state operating permit.

Basis for Limitations Codes:

1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Lagoon Policy
5. Ammonia Policy
6. Dissolved Oxygen Policy
7. Antidegradation Policy
8. Water Quality Model
9. Best Professional Judgment
10. TMDL or Permit in lieu of TMDL
11. WET Test Policy
12. Antidegradation Review

PERMITTED FEATURE #010– DERIVATION AND DISCUSSION OF LIMITS:
Permitted Feature #010 is established in this permit to characterize the intake water at the facility, for compliance with effluent limits at Outfall #001.

- **Flow (Stream)**. Daily monitoring only requirement in cfs. It is the department's expectations that the permittee will obtain stream flow data from appropriate and applicable sources, such as the upstream USGS Gauging Stations (Missouri River at Hermann, MO). If there is a significant distance from the facility to the nearest gauging station, it may be in the best interest of the permittee to fund a new gauging station; however, it is not required. Additionally, the department will only use gauging station data as a viable source of stream flow. Meaning that flows (design or actual) from other point sources will not be considered (i.e., added to the flow determination).

- **Intake Flow**. Daily monitoring only requirement in cfs to use in the change in temperature and thermal discharge calculations.

- **Temperature (Stream)**. Daily monitoring only requirement in °F. For most facilities, the intake temperature can be used to determine stream's temperature. However, in some cases, the ambient stream temperature can be used. The permittee will need to inform the department that they may use the actual stream's temperature.

- **Hardness as $CaCO_3$.** Monitoring only. If at renewal, metal effluent limits are appropriate, the collection of hardness data at the intake will be used to calculate the appropriate limits.

- **Minimum Sampling and Reporting Frequency Requirements**. Sampling and reporting frequency requirements have been retained from previous state operating permit. Hardness monitoring was established at monthly.

OUTFALL #002, 009– ASH POND & EMERGENCY SPILLWAY FROM ASH PONDS

Effluent limitations derived and established in the below Effluent Limitations Table are based on current operations of the facility. Future permit action due to facility modification may contain new operating permit terms and conditions that supercedes the terms and conditions, including effluent limitations, of this operating permit. See Appendix D for discussion of other parameters and why monitoring or limits was not required and for comparison of parameters effluent limits to amount present in the discharge. This permit proposes additional monitoring at Outfall #002 if the revised 40 CFR 423 effluent limit guideline is not finalized within a year of permit issuance. The requirement is to provide enough data points to conduct a reasonable potential analysis or to redo the best technology analysis in Appendix C.

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
FLOW	MGD	1	*		*	NO	
CHEMICAL OXYGEN DEMAND	MG/L	9	*		*	YES	***
TSS (NET)	MG/L	1	100		30	NO	
TSS (GROSS)	MG/L	1,9	*		*	NO	
PH**	SU	1,2	6.5-9.0		6.5-9.0	YES	6.0-9.0
OIL & GREASE **	MG/L	1,2	15		10	YES	20/15
SULFATE AS SO_4	MG/L	2,9	*		*	NO	
CHLORIDE	µG/L	9	*		*	YES	***
BORON, TOTAL RECOVERABLE	µG/L	9	*		*	YES	***
TOTAL NITROGEN	MG/L	1	*		*	YES	***
TOTAL PHOSPHORUS	MG/L	1	*		*	YES	***
WHOLE EFFLUENT TOXICITY (WET) TEST	TUc	11	Please see WET Test in the Derivation and Discussion Section below.			YES	%SURVIVAL
MONITORING FREQUENCY	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.						

* - Monitoring requirement only.
** pH is measured in pH units and is not to be averaged. The pH is limited to the range of 6.5-9.0 pH units.
*** New parameter, not previously established

Basis for Limitations Codes:

1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Lagoon Policy
5. Ammonia Policy
6. Dissolved Oxygen Policy
7. Antidegradation Policy
8. Water Quality Model
9. Best Professional Judgment
10. TMDL or Permit in lieu of TMDL
11. WET Test Policy
12. Antidegradation Review

OUTFALL #002, 009– DERIVATION AND DISCUSSION OF LIMITS:
A discussion of Technology Based Effluent Limits (TBEL) and Water Quality Based Effluent Limits (WQBEL) is found below. Where differences exist, the more protective standard will be used to establish permit limitations, as summarized in the table at the end of this section.

- **Flow**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification.

- **Total Suspended Solids (Intake, Net, & Gross)**. Due to the fact that there are several sources with differing flows subject to different ELGs, effluent limitations for TSS will be established in concentration (mg/L) rather than mass (lb/day), in accordance with 40 CFR 423.12(b)(11). Additionally, TSS is to be reported as a net and/or gross limit in accordance with 40 CFR 122.45(g). Therefore, TSS limits are 100 mg/L as a Daily Maximum and 30 mg/L as a Monthly Average, in accordance with 40 CFR 423.12(b)(3) and (4). The following conditions apply to TSS limits for determining compliance with regards to credit for TSS from intake waters.

  1. Only water withdrawn from the Missouri River that is used for process (e.g., fly ash transport) water and discharged to the Missouri River is to be used in calculating the net discharge of TSS. Credit for TSS from other sources of water (including rainwater) can not be used for credit.
  2. Credit may be taken only to the extent necessary to meet effluent limits.
  3. The maximum credit may not exceed the concentration in the intake water
  4. All measures for flow and TSS must be made the same day.

  Net discharge is to be calculated as follows:
  $(Q_d \times 8.34 \times C_d) - (Q_r \times 8.34 \times C_r) / (Q_d \times 8.34)$ = Net discharge in mg/L

  Where:
  Q_d = Flow from Outfall #002 (in MGD) that was withdrawn from the Missouri River;
  C_d = Concentration of TSS measure in the final effluent from Outfall #002 in mg/L;
  Q_r = Intake flow (in MGD) that flows to Outfall #002 ;
  C_r = Intake flow TSS concentration.
  When taking credit for TSS in the intake water, the permittee will be required to document all measurements and calculations used to determine the amount of the credit and shall report the gross and the net discharge of TSS on the discharge monitoring report. Therefore, TSS intake and gross are required to have monitoring conditions only. The TSS Net discharge shall never be less than 0 mg/L.

- **pH**. In accordance with 40 CFR 423.12(b)(1), pH shall be maintained in the range of 6.0 – 9.0. In accordance with 10 CSR 20-7.031(4)(E), pH shall be maintained in the range of 6.5 – 9.0 pH SU, and pH is not to be averaged. DMRs for the past 5 years were reviewed and document that this facility can meet the new more protective limits. Therefore, pH limitation range will be applicable upon issuance of this operating permit

- **Oil & Grease**. Due to the fact that there are several sources with differing flows subject to different ELGs, effluent limitations for Oil and Grease will be established in concentration (mg/L) rather than mass (lb/day), in accordance with 40 CFR 423.12(b)(11). 20 mg/L as a Daily Maximum and 15 mg/L as a Monthly Average in accordance with 40 CFR 423.12(b)(3) & (4). The water quality standard for the protection of aquatic life; 10 mg/L monthly average, 15 mg/L daily maximum. DMRs for the past 5 years were reviewed and document that this facility can meet the new more protective limits. Therefore, O&G limits will be applicable upon issuance of this operating permit.

- **Technology-based Effluent Limit versus Water Quality-based Effluent Limit**
  Limitations in bold signify they are more protective and will be established as a permit limit.

Pollutant	TBEL (40 CFR 423)		WQBEL (10 CSR 20-7.031)	
	Daily Maximum	Monthly Average	Daily Maximum	Monthly Average
TSS	**100 mg/L**	**30 mg/L**	N/A	N/A
pH	6.0 – 9.0	6.0 – 9.0	**6.5 – 9.0**	**6.5 – 9.0**
Oil & Grease	20	15	**15**	**10**

- **Chemical Oxygen Demand.** Monitoring is included using the permit writer's best professional judgment. There is no water quality standard for COD; however, increased oxygen demand may impact instream water quality. COD is also a valuable indicator parameter. COD monitoring allows the permittee to identify increases in COD that may indicate materials/chemicals coming into contact with stormwater that cause an increase in oxygen demand. Increases in COD may indicate a need for maintenance or improvement of BMPs.

- **Sulfate, as SO_4**. Effluent limitations from the previous state operating permit have been reassessed and verified that they are still protective of the receiving stream's Water Quality. Therefore, effluent limitations have been retained from previous state operating permit, please see the APPLICABLE DESIGNATION OF WATERS OF THE STATE sub-section of the Receiving Stream Information. The drinking water standard for sulfate is 250 mg/L. Monitoring only.

- **Chloride**. Missouri has proposed a state water quality standards change since the previous permit was issued. In the proposed standard, the sulfate standard for protection of aquatic life is dependent on the hardness and the chloride concentration. The hardness concentration is being collected under Outfall 001.

- **Boron, Total Recoverable.** In evaluating the expanded test results for Outfall 002 and comparing with the background concentration and the technology based effluent limit determination, monitoring only is being required for this permit.

- **Total Phosphorus and Total Nitrogen.** Monitoring required for facilities greater than 100,000 gpd design flow per 10 CSR 20-7.015(9)(D)7. Total Nitrogen shall be determined by testing for Total Kjeldahl Nitrogen (TKN) and Nitrate + Nitrite and reporting the sum of the results (reported as N). Nitrate + Nitrite can be analyzed together or separately.

- **WET Test**. Outfall 002 has WET testing requirements. WET Testing schedules and intervals are established in accordance with the department's Permit Manual; Section 5.2 *Effluent Limits / WET Testing for Compliance Bio-monitoring.* It is recommended that WET testing be conducted during the period of lowest stream flow.
  [FORMCHECKBOX] Chronic
  [FORMCHECKBOX] No less than **ONCE/YEAR:**
  [FORMCHECKBOX] Facility is designated as a Major facility or has a design flow ≥ 1.0 MGD.
  [FORMCHECKBOX] Facility has Water Quality-based effluent limitations for toxic substances (other than NH_3).

  Acute AEC% = $((\text{design flow}_{cfs} + ZID_{7Q10}) / \text{design flow}_{cfs})^{-1}] \times 100$ = ##%
  Acute AEC% = $((89.59 + 1379) / 89.59)^{-1}] \times 100$ = 6.1% rounded up to 7%
  Dilution series is as follows: 100%, 50%, 25%, 7.0%, and 3.5%

- **Minimum Sampling and Reporting Frequency Requirements**. Sampling and reporting frequency requirements have been retained from previous state operating permit. Chloride, Boron, and Molybdenum sampling shall match sulfate monitoring of quarterly. Outfall 009, emergency spillway sampling is once per discharge.

OUTFALL #002A- ACTIVATED SLUDGE TREATMENT PLANT, SANITARY WASTEWATER

Effluent limitations derived and established in the below Effluent Limitations Table are based on current operations of the facility. Future permit action due to facility modification may contain new operating permit terms and conditions that supersede the terms and conditions, including effluent limitations, of this operating permit.

EFFLUENT LIMITATIONS TABLE:

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
FLOW	GPD	1	*		*	NO	
BOD_5	MG/L	1	45		30	NO	
TSS	MG/L	1	45		30	NO	
PH	SU	1	6.0-9.0		6.0-9.0	NO	
AMMONIA AS N	MG/L	2	*		*	YES	***
CHLORINE, TOTAL RESIDUAL	MG/L	2	*		*	YES	***
ESCHERICHIA COLI FORM	**	1,2,3	Please see Escherichia Coli (E. coli) in the Derivation and Discussion Section below.			YES	***
MONITORING FREQUENCY	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.					NO	

* - Monitoring requirement only.
** - # of colonies/100mL; the Monthly Average for *E. coli* is a geometric mean.
*** - Parameter not previously established in previous state operating permit.

Basis for Limitations Codes:

1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Lagoon Policy
5. Ammonia Policy
6. Dissolved Oxygen Policy
7. Antidegradation Policy
8. Water Quality Model
9. Best Professional Judgment
10. TMDL or Permit in lieu of TMDL
11. WET Test Policy
12. Antidegradation Review

OUTFALL #002A– DERIVATION AND DISCUSSION OF LIMITS:

- **Flow**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification.

- **Biochemical Oxygen Demand (BOD_5).** Effluent limitations from the previous state operating permit have been reassessed and verified that they are still protective of the receiving stream's Water Quality. Therefore, effluent limitations have been retained from previous state operating permit, please see the **APPLICABLE DESIGNATION OF WATERS OF THE STATE** sub-section of the **Receiving Stream Information.**

- **Total Suspended Solids (TSS).** Effluent limitations from the previous state operating permit have been reassessed and verified that they are still protective of the receiving stream's Water Quality. Therefore, effluent limitations have been retained from previous state operating permit, please see the **APPLICABLE DESIGNATION OF WATERS OF THE STATE** sub-section of the **Receiving Stream Information**.

- **pH**. 6.0-9.0 SU. Technology based limits [10 CSR 20-7.015] are protective of the water quality standard [10 CSR 20-7.031(5)(E)], due to the buffering capacity of the mixing zone

- **Total Ammonia Nitrogen.** A monitoring requirement only will be established in the permit. Upon next renewal, monitoring data will be used to conduct a Reasonable Potential Analysis. Early Life Stages Present Total Ammonia Nitrogen criteria apply [10 CSR 20-7.031(4)(B)7.C.] default pH 7.8 SU. Background total ammonia nitrogen = 0.03 mg/L in the Missouri River

- ***Escherichia coliform (E. coli).*** Monthly average of 206 per 100 mL as a geometric mean and Daily Maximum of 1030 during the recreational season (April 1 – October 31), to protect Whole Body Contact Recreation (B) designated use of the receiving stream, as per 10 CSR 20-7.031(4)(C). An effluent limit for both monthly average and daily maximum is required by 40 CFR 122.45(d). Design flow of the treatment plant is less than 100,000 gpd, thus the monitoring frequency is equal to the other parameters of once per quarter. Ameren plans to install ultraviolet disinfection to meet *E. Coli* effluent limits.

- **Minimum Sampling and Reporting Frequency Requirements**. Sampling and reporting frequency requirements have been retained from previous state operating permit.

OUTFALLS #003-006– STORMWATER RUNOFF, BENCHMARKS

EFFLUENT LIMITATIONS TABLE:

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM BENCHMARK	MODIFIED	PREVIOUS PERMIT LIMITATIONS
FLOW	GPD	1	*	YES	**
COD	MG/L	1,2,3	90	YES	**
SETTLEABLE SOLIDS	ML/L/HR	1,2,3	1.5	YES	**2.0/1.0**
PH	SU	1	6.5-9.0	YES	**6.0-9.0**
OIL & GREASE	MG/L	1	10	YES	**15/10**
MONITORING FREQUENCY	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.				

* - Monitoring requirement only.
** - Parameter not previously established in previous state operating permit.
*** - There shall be no PCBs in the effluent.

Basis for Limitations Codes:

1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Lagoon Policy
5. Ammonia Policy
6. Dissolved Oxygen Policy
7. Antidegradation Policy
8. Water Quality Model
9. Best Professional Judgment
10. TMDL or Permit in lieu of TMDL
11. WET Test Policy
12. Antidegradation Review

OUTFALLS #003 - #006 – DERIVATION AND DISCUSSION OF LIMITS:

- **Flow**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification.

- **Chemical Oxygen Demand (COD_5).** Based on data submitted on Form 2F of the application for renewal, monitoring is included using the permit writer's best professional judgment. There is no water quality standard for COD; however, increased oxygen demand may impact instream water quality. COD is also a valuable indicator parameter. COD monitoring allows the permittee to identify increases in COD that may indicate materials/chemicals coming into contact with stormwater that cause an increase in oxygen demand. Increases in COD may indicate a need for maintenance or improvement of BMPs. Additionally, a benchmark value will be implemented for this parameter. The benchmark value will be set at 90 mg/L. This value falls within the range of values implemented in other permits that have similar industrial activities and the Environmental Protection Agency's (EPA's) *Multi-Sector General Permit For Stormwater Discharges Associated With Industrial Activity* (MSGP).

- **Settleable Solids.** Effluent limitations from the previous state operating permit have been reassessed. Monitoring remains on the stormwater outfalls for settleable solids to ensure the best management practices are maintained and operating correctly. The permittee is required to develop and implement a SWPPP and adhere to Best Management Practices (BMPs).

- **pH**. pH shall be maintained within the range from 6.5 to 9.0 Standard Units (SU) as per 10 CSR 20-7.031(4)(E).

- **Oil & Grease**. Conventional pollutant, effluent limitation for protection of aquatic life; 10 mg/L monthly average, 15 mg/L daily maximum.

- **Minimum Sampling and Reporting Frequency Requirements**. Sampling will be required at a minimum of quarterly to verify that the best management practices are being maintained and operated correctly. Reporting frequency will be quarterly.

Part VI – Compliance with SWPPP Requirements to Achieve Benchmark Values

The purpose of a SWPPP is to comply with all applicable stormwater regulations by creating an adaptive management plan to control and mitigate pollution of stormwater runoff. Developing a SWPPP provides opportunities to employ appropriate BMPs to minimize the risk of pollutants being discharged with during storm events. The following paragraph outlines the general steps the permittee should take to determine which BMPs will work to achieve the benchmark values discussed in Part V above. This section is not intended to be all encompassing or restrict the use of any physical BMP or operational and maintenance procedure that will assist in pollution control. Additional steps or revisions to the SWPPP may be required to meet the requirements of the permit. Additional information can be found in EPA's *Developing Your Stormwater Pollution Prevention Plan, A Guide for Industrial Operators*, (Document number EPA 833-B-09-002) [published by the United States Environmental Protection Agency (USEPA) in February 2009].

In order to effectively control the pollutants being discharged in stormwater runoff, potential stormwater pollution sources must be identified. Areas which should be included in the SWPPP are identified in 40 CFR 122.26(b)(14). The pollutants of concern that have already been identified in Part V above can be used to assist in identifying potential sources. Once these potential sources of stormwater pollution have been identified, a plan should be formulated to best control the amount of pollutant being released and discharged by each activity or source. This should include, but is not limited to, minimizing exposure to stormwater, good housekeeping measures, proper facility and equipment maintenance, spill prevention and response, vehicle traffic control, and proper materials handling. Once a plan has been developed, employ the control measures that have been determined to be adequate to achieve the benchmark values discussed above. Conduct monitoring and inspections of the BMPs to ensure they are working properly. Re-evaluate any BMP that is not achieving compliance with permitting requirements. For example, if sample results from either outfall show values of TSS above the benchmark value, the BMP being employed is deficient in controlling stormwater pollution. Corrective action should be taken to repair, improve or replace the failing BMP. This internal evaluation is required at least once per month but should be continued more frequently if BMPs continue to fail. If failures do occur, continue this trial and error process until appropriate BMPs have been established. If failures continue to occur and the permittee feels there are no practicable or cost-effective BMPs that will sufficiently reduce a pollutant concentration in the discharge to the benchmark values established in the permit, the permittee can submit a request to re-evaluate the benchmark values. This request needs to include a detailed explanation of why the facility is unable to comply with the permit conditions and unable to establish BMPs to achieve the benchmark values. Provide financial data of the company and documentation of cost associated with BMPs for review. This will allow the department to conduct a cost analysis on control measures and actions taken by the facility to determine cost-effectiveness of BMPs. The request should also include the SWPPP, which should contain adequate documentation of BMPs employed, failed BMPs, corrective actions, and all other required information. The request shall be submitted in the form of an operating permit modification application. Appropriate application forms can be found on the Department's website: [HYPERLINK "http://dnr.mo.gov/forms/index.html"].

Part VII – Administrative Requirements

On the basis of preliminary staff review and the application of applicable standards and regulations, the department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the operating permit. The proposed determinations are tentative pending public comment.

PERMIT SYNCHRONIZATION:
The Department of Natural Resources is currently undergoing a synchronization process for operating permits. Permits are normally issued on a five-year term, but to achieve synchronization many permits will need to be issued for less than the full five years allowed by regulation. The intent is that all permits within a watershed will move through the Watershed Based Management (WBM) cycle together will all expire in the same fiscal year. This will allow further streamlining by placing multiple permits within a smaller geographic area on public notice simultaneously, thereby reducing repeated administrative efforts. This will also allow the department to explore a watershed based permitting effort at some point in the future.

The Labadie Energy Center Permit will be issued for 5 years. Due to the conditions as of this permit to reestablish a monitoring program and develop a groundwater program, this permit will be synchronized with the other permits in the watershed during the next permit cycle.

PUBLIC NOTICE:
The department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest in and water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and permittee must be notified of the denial in writing.

The department must issue public notice of a pending operating permit or of a new or reissued statewide general permit. The public comment period is the length of time not less than 30 days following the date of the public notice which interested persons may submit written comments about the proposed permit. For persons wanting to submit comments regarding this proposed operating permit, then please refer to the Public Notice page located at the front of this draft operating permit. The Public Notice page gives direction on how and where to submit appropriate comments.

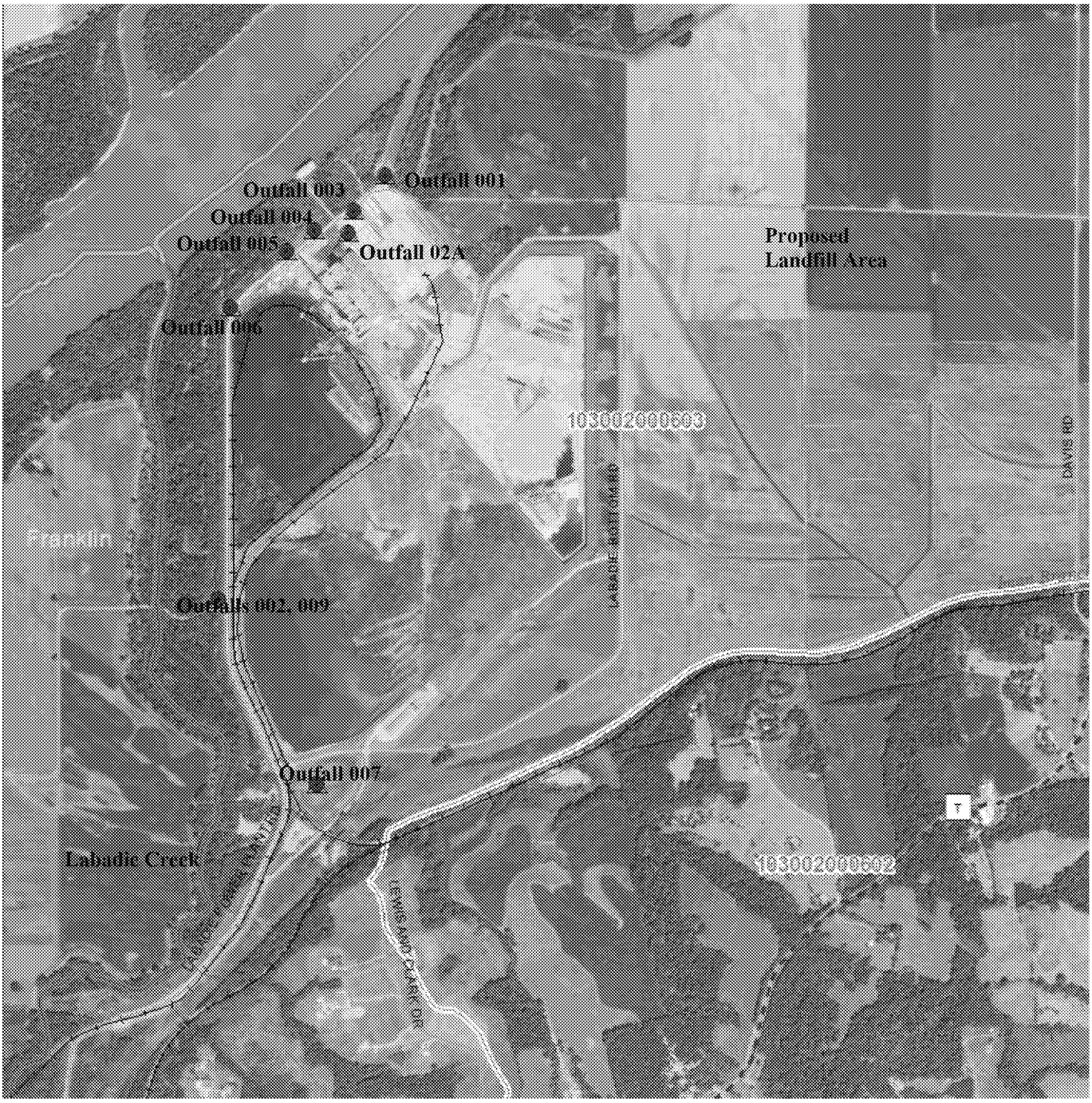
[FORMCHECKBOX] - The Public Notice period for this operating permit was from January 2, 2015 to March 3, 2015. Responses to the Public Notice of this operating permit warrant the modification of effluent limits and/or the terms and conditions of this permit. Modifications include groundwater monitoring program around both ash ponds, increased stormwater monitoring to quarterly and additional documentation in the factsheet. See Appendices G and H for discussion of comments received from the public hearing on February 17, 2015, the Sierra Club, and from Ameren. See Appendix H for the addition to the factsheet dated November 2015, the TBEL determination for once-through cooling and its thermal discharge.

DATE OF FACT SHEET: NOVEMBER 14, 2012; JANUARY 17, 2013; NOVEMBER 3, 2014; MARCH 5, 2015; NOVEMBER 5, 2015

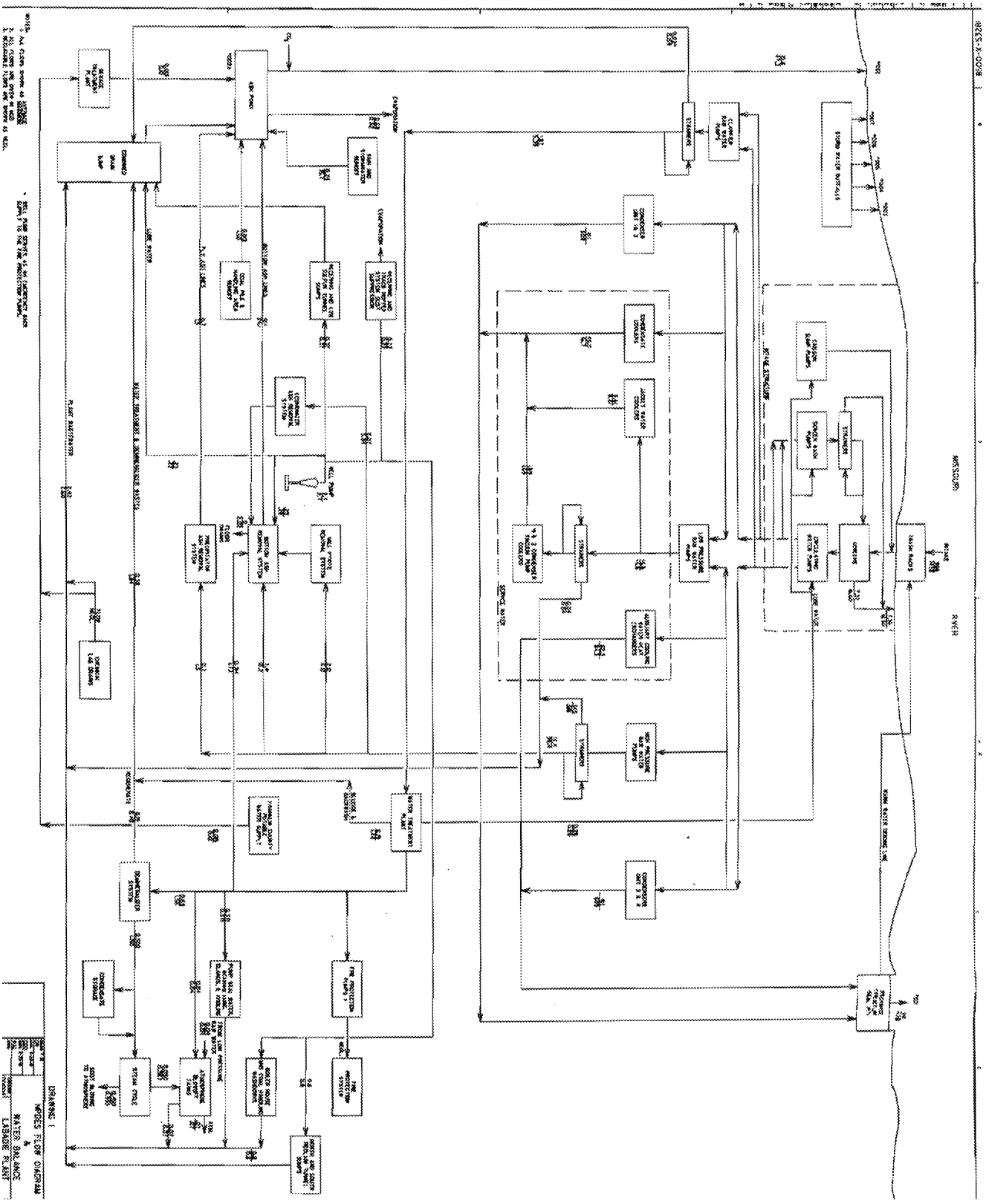
COMPLETED BY:
LEASUE MEYERS, EIT
OPERATING PERMITS SECTION,
WATER PROTECTION PROGRAM
[HYPERLINK "mailto:leasue.meyers@dnr.mo.gov"]

Appendices
Appendix A: Facility Map
Appendix B: Water Flow Diagram
Appendix C: TBEL determination for Outfall #001 and #002
Appendix D: Water Quality Standards and Base Limits for Outfall #002
Appendix E: Pre-Public Notice Comments
Appendix F: 2013 Public Notice Comments
Appendix G: 2015 Public Hearing & Notice Comments
Appendix H: TBEL determination for Once-Through Cooling

Appendix A: Facility Map



Appendix B: Water Flow Diagram



Appendix C: TBEL Determination

The EPA in 2009 published the "Steam Electrical Power Generating Point Source Category: Final Detailed Study Report (2009 Final Report). The 2009 Final Report summarizes data collected and analyzed from the EPA to review discharges from steam electrical power generating industry and to determine whether the current effluent guidelines for this industry and to determine whether current Effluent Limit Guidelines (ELGs) for this industry should be revised. From the 2009 Final Report, it determined a need existed to update the current effluent regulations specific to Steam Electrical Power Generating Point Sources [40 CFR Part 423]. The 2009 Final Report also concluded that the last updated version of this 1982 regulation does not adequately address the pollutants being discharged and have not kept pace with changes that have occurred in the power industry.

The 2009 Final Report identified pollutants that are commonly associated with the power industry (i.e., Flue Gas Desulfurization [FGD] & Coal Combustion Residuals [CCR]). The 2009 Final Report does not address how to determine a Pollutant of Concern (POC), but (as stated above) determined a need for the EPA to revise the current ELG 40 CFR 423. The EPA expects to complete this rulemaking and promulgate revised effluent guidelines in late 2014.

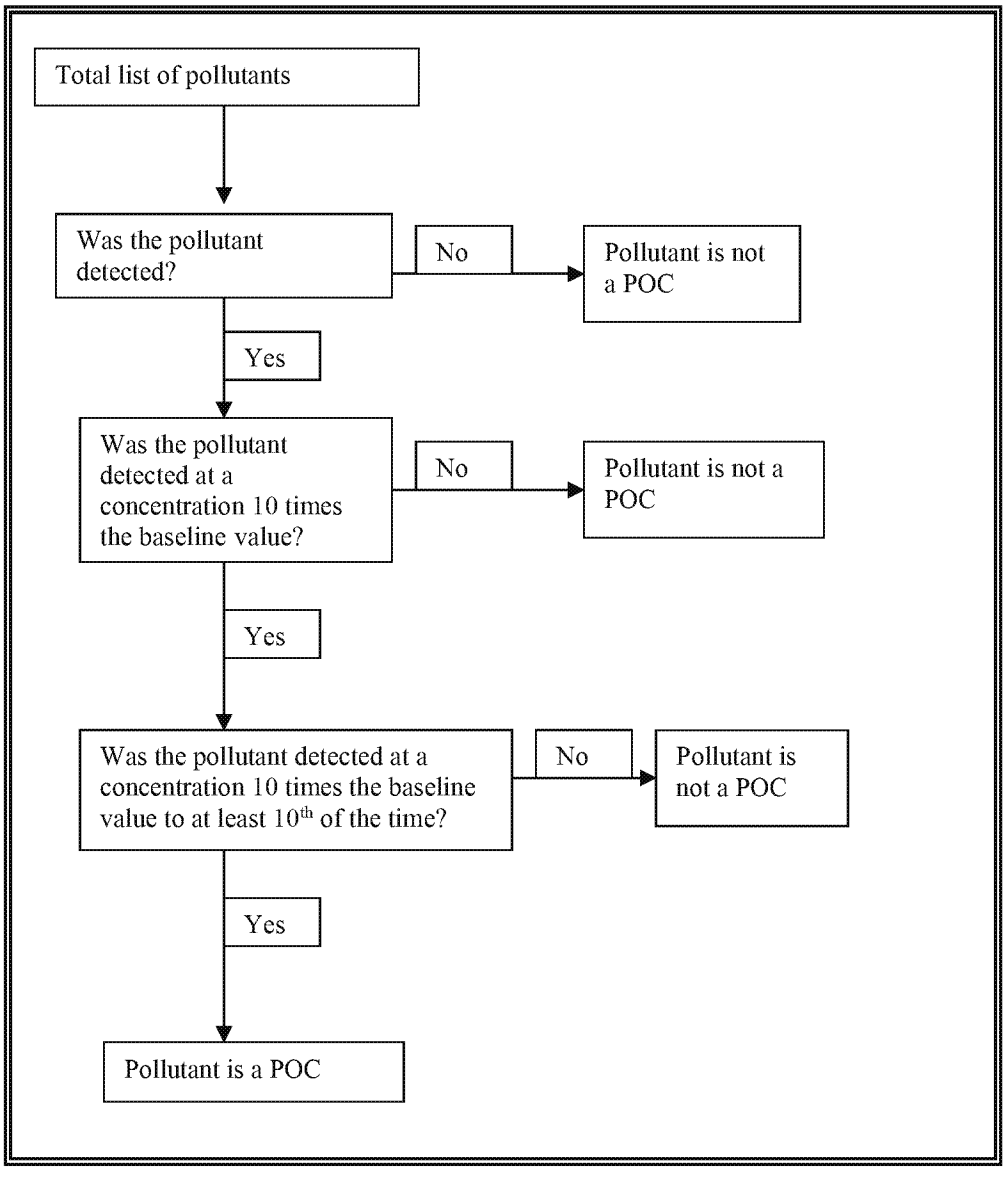
On June 7, 2010, the EPA's Office of Wastewater Management sent a memorandum to provide interim guidance to assist permitting authorities to appropriately establish permit requirements for wastewater discharges from FGD systems and CCR impoundments at steam power plants. The 2010 EPA memo contained two (2) attachments: Appendix A – provided permitting authorities with information on how to establish TBELs for FGD; and Appendix B – was intended to assist permitting authorities to better address water quality impacts associated with discharges from coal ash impoundments. The 2010 EPA memo does not demonstrate how to determine if a pollutant needs to have TBEL limits.

Federal regulation 40 CFR Part 125.3(c) and 40 CFR Part 125.3(d) are the basis for establishing technology-based effluent limits and BPJ TBELs. To better understand these regulations, the EPA's Permit Writers Manual 5.2.3.2 discusses how to identify the need for case-by-case TBELs. In this section of the EPA Permit Writers Manual, it is the fourth bullet point that is specific to power plant industries with regard to the 2009 Final Report and the 2010 EPA memo. It states, "*When effluent guidelines are available for the industry category, but no effluent guidelines requirements are available for the pollutant of concern (e.g., a facility is regulated by the effluent guidelines for Pesticide Chemicals [Part 455] but discharges a pesticide that is not regulated by these effluent guidelines). The permit writer should make sure that the pollutant of concern is not already controlled by the effluent guideline and was not considered by the EPA when the Agency developed the effluent guideline.*"

In order to develop BPJ TBEL, POC should be determined first. The EPA Permit Writers Manual 5.2.1.2 informs staff to review the *Central Wastewater Treatment Category Technical Development Document,* Chapter 6, Figure 6-1 Pollutant of Concern Methodology (CWT Document). From the CWT Document, Figure 1 – How to Determine a POC has been created.

Appendix C: TBEL Determination (continued):

Figure 1 – How to Determine a POC



Baseline Values for the CWT Document are established in Chapter 15 of the same document. The baseline values for the potential POCs is located below. In accordance to Figure 1 and Chapter 6 of the CWT document, the baseline is multiplied by 10 prior to comparing with analyzed pollutants.

The below table documents the effluent samples from each of the applicable outfalls and the baseline values (x10) from Chapter 15. Outfalls #003 through #008 are not applicable to this review. Outfall #001 is once through cooling water. Outfall #002 is the process water and stormwater discharge from the ash ponds. Outfall #009 is an emergency discharge that is being established in this permit, but is the same as Outfall #002. Permitted feature #010 is for documentation at the intake structure and as such is not applicable to this evaluation, at this time. A best professional judgment decision on permitted feature #010 will be made at permit renewal, with the conclusions based on the required 316(b) studies.

APPENDIX C- TBEL DETERMINATION (continued):

Table 1 below documents that Total Suspended Solids, total phosphorus, nitrate-nitrate, boron meet the initial determination of being POCs, based on the one sample taken as part of the expanded effluent testing completed with the renewal application. Total Suspended Solids are subject to an Effluent limit Guideline for Outfall #002, along with net credits to meet the ELG. The TSS effluent meets the ELG limit. Nitrate-nitrite and total phosphorus are identified as potential pollutant of concern and as a result of the changes to the Effluent Regulations in 10 CSR 20-7.015, the facility is being required to monitor total nitrogen and total phosphorus. Boron meets the criteria as a pollutant of concern, there shall be monitored quarterly from Outfall #002 for this permit cycle.

Boron is the parameter identified above that needs to go through the Technology based effluent process, as required in 40 CFR 125.3. The evaluation of technologies below is focused on the removal of boron, as that is the parameter identified in Table 1; currently the best available technology does not remove boron but merely concentrates the boron into another waste stream. The concentrate stream creates an even more formidable disposal problem. Cost associated with this disposal will be prohibitive. Conversion to dry handling is the long term plan already identified by Ameren with their plan to construct an utility waste landfill and with the changes required to the process under the Coal Combustion Rule, 40 CFR 257, and with the proposed revision to the Steam Electric Generating Effluent Limit Guideline, 40 CFR 423. The summary of factors that need to be considered in developing case by case TBELs are listed in Figure 2 from the NPDES Permit Writer's Manual.

This technology limitation is addressed by several factors in the case by case TBEL development.

The Department of Natural Resources' Water Protection Program has determined that the analysis contained in this Appendix C, regarding pollutants of concern is necessary to protect human health, public welfare, or the environment. In regards to boron, quarterly monitoring is required from Outfall #002.

APPENDIX C- TBEL DETERMINATION (continued):

Table 1: TBEL Determination

PARAMETER	UNITS	OUTFALL 001	OUTFALL 002	BASELINE	BASELINE*10	BACKGROUND CONCENTRATION[i]	POTENTIAL
BIOCHEMICAL OXYGEN DEMAND	mg/L	1	3	2	20	1	NO
CHEMICAL OXYGEN DEMAND	mg/L	25.7	27.8	5	50	25.7	NO
TOTAL ORGANIC CARBON	mg/L	3.8	3.8	1	10	3.7	NO
TOTAL SUSPENDED SOLIDS	**mg/L**	**43**	**16**	**4**	**40**	**595**	**YES**
AMMONIA	mg/L	0.08	0.01	0.05	0.5	0.03	NO
BROMIDE	mg/L	2.78	0.25	NB	NB	2.5	NO
CHLORINE, TOTAL RESIDUAL	mg/L	BA,NT	BA,NT	NB	NB	NT	NB
FLUORIDE	mg/L	BP,NT	0.58	0.1	1	0.68	NO
NITRATE-NITRITE	**mg/L**	**2.2**	**0.62**	**0.05**	**0.5**	**1.22**	**YES**
NITROGEN, TOTAL ORGANIC	mg/L	0.55	0.61	NB	NB	0.62	NO
OIL AND GREASE	mg/L	1.8	0.3	5	50	1.5	NO
PHOSPHORUS, TOTAL	**mg/L**	**0.24**	**1.14**	**0.01**	**0.1**	**0.37**	**YES**
SULFATE	mg/L	66	57	NB	NB	116	NO
SULFIDE	mg/L	BA,NT	BA,NT	1	10	NT	YES
SULFITE	mg/L	BA,NT	2	NB	NB	1.5	NO
SURFACTANTS	mg/L	0.004	0.14	NB	NB	0.05	NO
ALUMINUM	mg/L	BP,NT	0.855	0.2	2	2.57	NO
BARIUM	mg/L	0.4	0.212	0.2	2	0.122	NO
BORON	**mg/L**	**0.22**	**1.15**	**0.1**	**1**	**0. 06**	**YES**
COBALT	mg/L	BA,NT	BA,NT	0.05	0.5	0.002	NO
IRON	mg/L	BP,NT	0.536	0.1	1	2.31	NO
MAGNESIUM	mg/L	17.2	18.3	5	50	17.8	NO
MOLYBDENUM	mg/L	0.008	0.052	0.01	0.1	0.006	NO
MANGANESE	mg/L	0.29	0.057	0.015	0.15	0.2	NO
TIN	mg/L	BA,NT	BA,NT	0.03	0.3	NT	YES
TITANIUM	mg/L	0.25	0.033	5	50	0.107	NO
ANTIMONY	µg/L	9	0.5	20	200	0.5	NO
ARSENIC, TOTAL	µg/L	16	0.5	10	100	2.4	NO
BERYLLIUM	µg/L	3	0.5	5	50	0.5	NO
CADMIUM, TOTAL	µg/L	2	0.5	5	50	2.9	NO
CHROMIUM, TOTAL	µg/L	23	4	10	100	5	NO
COPPER, TOTAL	µg/L	17	2	25	250	6.3	NO
LEAD, TOTAL	µg/L	12	0.5	50	500	0.5	NO
MERCURY, TOTAL	µg/L	0.025	0.5	0.2	2	0.5	NO
NICKEL, TOTAL	µg/L	27	4	40	400	8	NO
SELENIUM, TOTAL	µg/L	2.5	0.5	5	50	1.67	NO
SILVER, TOTAL	µg/L	0.5	0.5	10	100	0.5	NO
THALLIUM, TOTAL	µg/L	6	0.5	10	100	0.5	NO
ZINC, TOTAL	µg/L	70	18	20	200	13.76	NO
CYANIDE, TOTAL	µg/L	7	2.5	20	200	2.5	NO
PHENOLS, TOTAL	µg/L	2.5	2.5	50	500	2.5	NO

[i] = Background Concentrations were obtained from USGS Gauging Station Missouri River at Hermann, MO. 1969-2012(average value), or from Form C of the Renewal Application for those parameters not monitored at the gaging station.

BA, NT- believe absent, not tested

BP, NT-believe present, not tested. Are known to exist in the Missouri River, but not expected to include a contribution from the non-contact cooling water.

NB- no baseline

NT-not tested

APPENDIX C- TBEL DETERMINATION (continued):

Figure 2: Summary of factors in case by case TBEL development[1]

For BPT requirements (all pollutants)
- The age of equipment and facilities involved*
- The process(es) employed*
- The engineering aspects of the application of various types of control techniques*
- Process changes*
- Non-water quality environmental impact including energy requirements*
- The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application

For BCT requirements (conventional pollutants)
- All items in the BPT requirements indicated by an asterisk (*) above
- The reasonableness of the relationship between the costs of attaining a reduction in effluent and the derived effluent reduction benefits
- The comparison of the cost and level of reduction of such pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources

For BAT requirements (toxic and non-conventional pollutants)
- All items in the BPT requirements indicated by an asterisk (*) above
- The cost of achieving such effluent reduction

1. Age of Equipment
   The bottom ash pond was constructed at the beginning of plant operation in 1970 and does not contain a liner. It has a surface area of 154 acres, with a total storage capacity of 12,000 acre-ft and the current volume of stored ash is approximately 11,403 acre-ft. The fly ash pond is lined and was constructed in 1993. Its total surface area is 79 acres, with a total storage capacity of 1,900 acre-ft and the current volume of stored ash is approximately 1,353 acre-ft. Based on a historic review from 2006 through 2010, Labadie generated an average of 390,000 tons of fly ash and 166,000 tons of bottom ash yearly.

2. Process Employed
   Flows from the coal ash pile, low volume waste, fly ash, bottom ash, and the wastewater treatment plant flow into the ash ponds for retention, pH neutralization, and settling prior to discharge to the Missouri River. The source of the water for flows is the Missouri River water utilized in plant operations. The facility qualifies for intake credit since the source of the water is the Missouri River and it is returned to the Missouri River.

3. Engineering Aspects of application of various types of control techniques

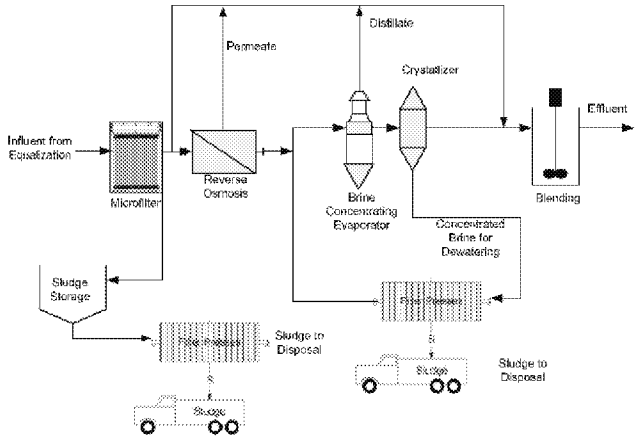
   Transport to a wastewater treatment plant, would be taking the flows from Labadie Energy Center to the City of Labadie treatment plant or to transport flows to MSD Bissell Point, which does accept the sludge from Labadie's domestic wastewater treatment plant. This option is not preferable due to distance; having to pay for disposal, and Labadie and MSD Bissell Point not having the capacity to handle flows.

   Conventional water treatment (coagulation, sedimentation, and filtration) does not significantly remove boron, and special methods would have to be installed in order to remove boron from waters with high boron concentrations. The treatment technologies available for removal of boron are limited and have not changed from what was documented in a 1976 technology and economic study done by EPA on the removal of Boron from wastewater. Boron is extremely mobile in water and hard to remove. Lime precipitation and filtration was identified as a possible removal method in the 1976 EPA study along with reverse osmosis and ion exchange but was quickly eliminated as a viable treatment method due to less than 25% effectiveness in laboratory experiments[5].

   Reverse osmosis is a membrane-technology filtration method that removes large molecules and ions from solutions by applying pressure to the solution when it is on one side of a selective membrane. The result is that the solute is retained on the pressurized side of the membrane and the pure solvent is allowed to pass to the other side (see figure 3[2]). This process will require flow equalization, additional storage, sludge hauling, and addition of chemicals. Reverse osmosis will remove the majority of parameters found in the leachate from the leachate water; however from research on reverse osmosis for boron removal, the process will remove boron down to a range between 1.0 to 2.3 mg/L[3/4]. This is only a slight reduction in boron concentration, the benefits of which are substantially offset by the establishment of a new, more concentrated waste stream that will need to be collected and separately disposed of after the reverse osmosis treatment process.

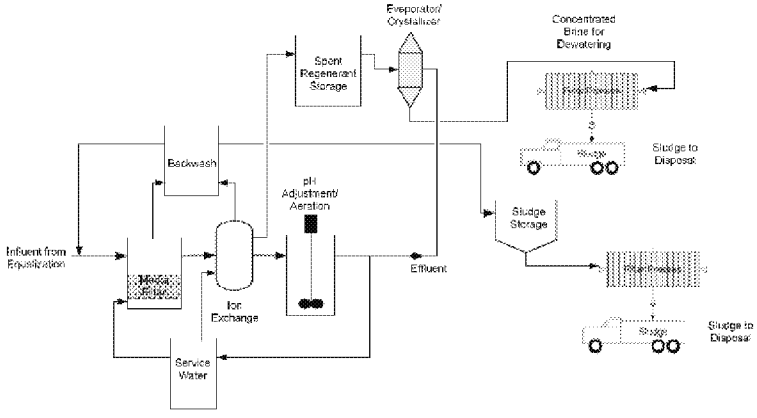
APPENDIX C- TBEL DETERMINATION (continued):

Figure 3: Reverse Osmosis Plant Diagram[2]



Ion Exchange is a water treatment method where undesirable contaminants are removed from water by exchange with another substance. Both the contaminant and the exchanged substance must be dissolved and have the same type of electrical charge (see figure 4[2]). This process will require flow equalization, additional storage, sludge hauling, and addition of chemicals. The ion exchange system will remove the majority of parameters found in the leachate from the leachate water; however from research on ion exchange systems for boron removal, the process will remove boron down to a range between 1.0 to 2.3 mg/L[3/4]. This is only a slight reduction in boron concentration, the benefits of which are substantially offset by the establishment of a new, more concentrated waste stream that will need to be collected and separately disposed of.

Figure 4: Ion Exchange Plant Diagram



Electrocoagulation involves the generation of coagulants in situ by dissolving electrically either aluminum or iron ions from respectively aluminum or iron electrodes. The metal ion generation takes place at the anode; hydrogen gas is released from the cathode. Also, the hydrogen gas would help to float the flocculated particles out of the water. This process sometimes is called electroflocculation. The materials can be aluminum or iron in plate form or packed form of scraps such as steel turnings, millings, etc. In studies completed, the boron concentration in the influent was investigated with regards to energy consumption. The obtained results shown that increasing boron concentration increased conductivity of solution. Thus, solution with higher boron concentration had more ions at the same volume. The higher conductivity values decreased energy consumption. Thus with low boron concentrations, more energy is required to remove the initial boron concentration. Electrocoagulation has been shown to remove from 80% to over 90% of the initial boron concentrations; however those tests have been run at 12 mg/L to 1000 mg/L.[5/6] The use of an electrocoagulation system at a Vancouver ship yard at 25 gpm (36,000 gpd) batch discharge had an initial boron concentration of 4.9 mg/L had a reduction of 21% to 3.86 mg/L. Electrocoagulation requires high power consumption and maintenance, in replacement and cleaning of the electrodes.

APPENDIX C- TBEL DETERMINATION (continued):

Vapor Compression Evaporation is often referred to as a zero liquid discharge system. Vapor Compression Evaporation Systems typically consist of brine concentration in combination with forced circulation crystallizers. Vapor Compression Evaporation has been used to treat cooling tower blowdown at power plants since the 1970s. There are not plants in the country using vapor compression evaporation to treat utility waste landfill leachate and stormwater. Only one plant in the country is using vapor compression evaporation, Kansas City Power and Light- Iatan Unit 2 to treat flue gas desulfurization wastewater. That operation has only been in effect since 2010.[7/8] Treatment using a vapor compression evaporation system is usually accomplished in three steps: preconcentration of wastewater into a brine slurry using a brine concentratory, evaporation of the remaining water in the brine slurry using a forced-circulation crystallizer or spray dryer and dewatering of the resulting sludge using a filter press or centrifuge. The dewatered salt cake requires disposal at a classified landfill . Vapor compression evaporation systems require high energy demands with the brine concentrators and crystallizers. Using a vapor compression evaporator system has a high potentiol for scaling and corrosion, thus requiring a pretreatment upstream of brine concentrator to soften the wastewater. Softening the wastewater is usually accomplished by a reverse osmosis plant. Boron can interfer with the operation of the evaporation process by hindering the crystallization process, resulting in soldis that interefere with the crystallizers, thus special provisions are required. [7/8]

While chemical precipitation is not effective means of removing boron, it may work in removing molybdenum from wastewater. This can occur with the addition of ferric sulfate and lime for pH manipulation to get the molybdenum to flocculate out and settle.[11] The water can then be treated or discharged, while the cake formed from molybdenum will need dewatered and disposed of in a landfill.

4. Process changes

A potential process that Ameren could employ is conversion to a dry handling system or construction of a landfill for coal combustion residuals. Ameren has submitted a construction permit application to build a utility waste landfill for their ash to the department's Solid Waste Management Program on January 29, 2013 and a construction permit was issued January 2, 2015.

With the finalization of the Coal Combustion Rule, 40 CFR 257, on April 17, 2015 and the expected effluent limit guidelines, 40 CFR 423, conversion to dry handling, closure of the ash ponds, and changes in other plant processes will change the discharge from Outfall #002. The requirements in 40 CFR are self-implementing with a schedule for changes to occur. While the revised 40 CFR 423 is not finalized yet, the preferred options in the pre-publication draft rule showed were for dry handling of coal ash.

5. Non-water quality environmental impacts including energy requirements

The non-water quality environmental impacts for installation of a treatment technology for boron or molybdenum removal are great in terms of energy required and creation of additional wastestreams.

- The reverse osmosis system requires flow equalization, brine addition, blending, crystallization, sludge dewatering, and sludge removal, which will increase electricity, gasoline consumption (for trucking concentrated boron solute annual operation and maintenance.
- The requirements for the ion exchange system are very similar to the reverse osmosis plant. Neither the reverse osmosis system nor the ion exchange system will significantly reduce the boron concentration currently present in the water; however both will create a new concentrated waste stream.
- Electrocoagulation requires high energy consumption along with higher operation and maintenance in the cleaning and replacement of the electrodes. Additional polymers may be required to get the floc to precipitate out.
- Vapor Compression Evaporation system is high power users, requiring 70 to 100 kW-hr per 1000 gallons. Besides the high power requirements, the vapor compression system requires disposal of a salt cake in a landfill and often requires the addition of a pretreatment reverse osmosis system to prevent scaling and corrosion of the evaporators and crystallizers. [7]
- Chemical Precipitation requires large amounts of chemicals, such as lime and ferric sulfate for removal of metals from the discharge.

APPENDIX C- TBEL DETERMINATION (continued):

6. Total cost of application of technology in relation to reduction in effluent
   - The total cost of constructing a reverse osmosis system or an ion exchange system may result in the potential removal of 0.3 to 1.3 mg/L of boron from the ash pond system. The cost estimate for a reverse osmosis system for over 40,000 gpm (57 mgd) is more than $100 million (2010 dollars[2]). Besides the initial capital cost, the annual cost estimate to operate and maintain the reverse osmosis system is $1 million (2010 dollars[2]).

   - The cost to construct and install an ion exchange system is more than $100 million (2010 dollars[2]). Besides the initial capital cost, the annual operating and maintenance cost estimate for an ion exchange plant is more than $1 million (2010 dollars[2]).
   - Electrocoagulation has high operating costs due to its high energy requirements along with the replacement of electrodes. In the research completed by the department, a capital cost and or annual operating costs were not available. Electrocoagulation appears to work better in higher concentrations than in the lower concentrations present in this discharge.

   - The capital costs associated with the installation and operation of vapor compression evaporator equipment includes brine concentrators, evaporators, and crystallizers. These components are constructed from expensive metals and metal alloys, such as titanium. The evaporators and crystallizers are high power users, requiring 70 to 100 kW-hr per 1000 gallons. [7]

   - The cost for chemical precipitation for molybdenum removal was not found in the literature review conducted by the department.

7. Reasonableness of the cost of the application of technology and the removal of effluent
   The installation of a reverse osmosis plant, ion exchange system, vapor compression evaporator, or electrocoagulation has the potential to reduce the boron concentration down to 1.0 mg/L, along with a reduction in the molybdenum present. To achieve the reduction in concentrations, the plant would be required to spend more than $100 million to construct the system, plus an annual operating and maintenance cost of a million dollars.

   Boron's water quality standard is 2 mg/L (2,000 µg/L) is a drinking water standard and molybdenum do not have a water quality standard. The closest drinking water intake is Howard Bend WTP, 20 miles downstream of the Labadie Energy Center. The other metals and parameters in the TBEL POC determination (Figure 1) are not identified as needing a TBEL developed, or requiring a water quality based effluent limit, requiring Ameren Missouri to install a reverse osmosis, ion exchange system, vapor compression evaporator or electrocoagulation for the leachate from the landfill is neither reasonable or economically efficient.

   Ameren is already pursuing the option of an utility waste landfill to handle coal combustion residuals and to reduce flows from Outfall #002.

8. Comparison of cost and level of reduction
   Boron is currently present in the leachate at a concentration of 1.15 mg/L. The installation of a reverse osmosis plant or an ion exchange system has the potential to remove the boron concentration down to 1.0 mg/L. To achieve the reduction in boron concentrations, the plant would be required to spend over $100 million to construct the system, plus an annual operating and maintenance cost of $1 million. The installation of the treatment technologies does not appear to be a cost effective or practical option for the removal of 0.15mg/L of boron. Ameren is already pursuing the option of an utility waste landfill to handle coal combustion residuals and to reduce flows from Outfall #002.

9. Cost of achieving effluent reduction
   To utilize a reverse osmosis or an ion exchange system, the plant would be required to spend over $100 million to construct the system, plus an annual operating and maintenance cost of over $100 million. The vapor compression evaporator would cost even more as it could potentially require a reverse osmosis plant prior to the concentrators. The technologies capable of removing boron from the landfill leachate stream require a significant up-front investment and ongoing operating costs. Electrocoagulation may be more cost effective removal option; however it requires high operating and maintenance costs, along with a byproduct that will need disposed of. Ameren is already pursuing the option of an utility waste landfill to handle coal combustion residuals and to reduce flows from Outfall #002.

APPENDIX C- TBEL DETERMINATION (continued):

After applying factors 1, 2, 3, 4, 5, and 9 listed above, and considering the technologies and unique circumstances discussed above, the department has determined, based its best professional judgment, that establishing a monitoring-only requirement (Section 5.2.3.3 NPDES Permit Writers Manual) for boron and molybdenum in the MSOP is the most appropriate mechanism to carry out the provisions of the Clean Water Act at this time. The Department of Natural Resources' Water Protection Program has determined that the analysis contained in this Appendix C, regarding pollutants of concern is necessary to protect human health, public welfare, or the environment. In regards to boron, quarterly monitoring is required from Outfall #002.

References

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7. Smagula, William H. Letter to John King, Response to Informal EPA Request for Supplemental Information about Planned State of the Art, Flue Gas Desulfurization ("FGD") Wastewater Treatment System, dated October 8, 2010, [HYPERLINK "http://www.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-38.pdf"]
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9. EPRI, Treatment Technology Summary for Critical Pollutants of Concern in Power Plant Wastewaters, January 2007, [HYPERLINK "http://earth1.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-16.pdf"]
10. EPA, Chemical Technology and Economics in Environmental Perspectives Task II – Removal of Boron from Wastewater, Midwest Research Institute, April 1976

Appendix D: Water Quality Standards and Based Effluent Limits for Outfall #002

Effluent Limits to protect Aquatic Life Protection
[EMBED Equation.3] (EPA/505/2-90-001, Section 4.5.5)

Where C = downstream concentration
C_s = upstream concentration
Q_s = upstream flow
C_e = effluent concentration
Q_e = effluent flow

Example: Cadmium AQL Effluent Limits
Hardness at 25% percentile: 180 mg/L at the Hermann Gaging Station
WLA_c= (89.59+9753.25)0.4179 –(9753.2*0)/89.95= 45.91 µg/L
WLA_a=(89.59+895.9)9.16-(895.9*0)/89.5=100.76 µg/L
LTA_c=45.91*0.527=**24.217** µg/L
LTA_a=100.76*0.321=32.35 µg/L
AML=24.217*1.55=37.60 µg/L
MDL=24.217* 3.11=75.42µg/L

TABLE D-1: WATER QUALITY STANDARDS AND BASED EFFLUENT LIMITS FOR OUTFALL #002

Parameter	Units	AQL Water Quality Standard	AQL Average Monthly Limit WQBEL	AQL Maximum Daily WQBEL	Human Health/Drinking Water Standard	DWS Average Monthly Limit WQBEL	DWS Maximum Daily WQBEL	Outfall # 002 Concentration
nitrogen, total organic	mg/L	*	*	*	*	*	*	0.61
oil and grease	mg/L	10	15	10				0.3
phosphorus	mg/L	*	*	*	*	*	*	1.14
aluminum	mg/L	0.75	4.11	8.25				0.855
barium	mg/L				2	219.73	441.66	0.212
boron	mg/L	2	219.73	441.66				1.15
iron	mg/L	1	89.96	180.47	0.3	26.99	54.14	0.536
molybdenum	mg/L							0.052
manganese	mg/L				0.05	5.49	11.04	0.057
antimony	µg/L				4,300	472,421	949,566	0.5
arsenic, total	µg/L	20	1,799	3,609	50	4,498	9,023.6	0.5
beryllium	µg/L	5	449	902	4	359.8	721.9	0.5
cadmium, total	µg/L	0.41	37.59	75.42	5	21.7	55	0.5
chromium, total	µg/L							4
copper, total	µg/L	15.42	133.5	267.8	1,300	7,127.9	14,300	2
lead, total	µg/L	6.725	605	1213.7	15	82.2	165	0.5
mercury, total	µg/L	0.5	13.2	26.4	2	11	22	0.5
nickel, total	µg/L	85.81	4232	8491	100	548	1,100	4
selenium, total	µg/L	5	449.8	902.4	50	4,498	9,023.6	0.5
silver, total	µg/L	10.42	57.1	114.6	50	274.2	550	0.5
thallium, total	µg/L	6.3	692.2	1,391.2	2	219.7	441.7	0.5
zinc, total	µg/L	197.16	1,081	2,168.7	5,000	27,415	55,000	18
cyanide, total	µg/L	5	120.6	242				2.5
phenols, total	µg/L	2.56	55.9	112.2	0.1	0.5	1.1	2.5

Appendix E: Pre-Public Notice Comments Received

E-1: Comments received pre-public notice in 2012

Ameren was provided with a pre-public notice version of the permit on November 15, 2012. The department met with Ameren on December 14, 2012 to discuss the draft permit.

1. 316(a) Thermal Variance

   The proposed permit replaces the current generation-based heat rejection limits with two temperature-based "edge of mixing-zone" limitations. As explained in the Fact Sheet, MDNR acknowledges that Labadie Plant currently operates under a 316(a) variance. The purpose of a 316(a) variance is to provide relief when thermal standards are more restrictive than necessary. In the proposed permit the alternative standards implemented in response to the original variance are replaced with limits based on a new 29% mixing zone versus the default 25% included in 10 CSR 20 - 7.031(4)(D). This expanded mixing zone was derived by permit staff from a statistical analysis of historic data and does not reflect equivalency, or outcome of the original variance determination. Consequently, the new thermal standards proposed by the agency will restrict future operation of the plant. This is of particular concern to the company since Labadie Energy Center represents one of our major base load facilities with the plant responsible for the highest, total electrical energy production of any plant in our system.
   The original 316(a) demonstration concluded that the fishery both up and downstream of the Plant was in balance, even though Missouri's thermal water quality standards were not met under all Plant operating and Missouri River flow conditions. As noted by MDNR, a 316(a) variance was granted in 1977. However we note that this variance did not result in an expanded mixing zone (as described in the Fact Sheet), but instead resulted in two specific modifications to the NPDES permit. The first was elimination of the requirement for off-stream cooling. The second was the establishment of alternative thermal limitations, based on heat rejection as derived from electrical generation and thermodynamic calculations.
   In retrospect, the Plant has been in operation for over forty years and there has never been a fish kill associated with the thermal plume. This period of operation includes several significant and sustained periods of drought. While Ameren ceased biological monitoring at Labadie a number of years ago, our most recent data reveals no indication of adverse impacts. MDNR's assessment of both Ameren and agency data as part of the re-application review further concludes that "available data does not provide convincing evidence of greater numbers of fish upstream of the Labadie plant than downstream." Consequently, we feel the imposition of the newly proposed thermal standards represents an unjustified burden on the operation of the Labadie Energy Center.
   With deference to our stated position the company recognizes that the original 316(a) study is dated and we are also cognizant of the need to undertake more extensive aquatic assessments to either re-affirm the current variance or determine the need for alternative action. Consequently, we accept MDNR's position establishing a new 316(a) Biological Monitoring Program during the term of the next permit. We generally concur with the schedule laid out in the permit and believe it will allow adequate time to propose and agree on the scope, implement and collect two full years of field data, and analyze and present findings as part of the next permit reapplication. In light of the above considerations Ameren requests MDNR renew the existing heat rejection limits for the full term of the permit while the company conducts a biological monitoring program.

   The department is proposing to public notice the permit with the thermal discharge limits, along with monitoring of the stream, effluent temperature, and change in stream temperature. As part of this permit, Ameren is required to establish the biomonitoring program.

2. 316(b) Impingement and Entrainment Intake Structure Upgrades

   Since this comment was submitted, EPA promulgated a final rule implementing 316(b) requirements. Special condition #15 of this permit implements the relevant requirements found at 40 CFR 122.21, 40 CFR 125.94-98 and 40 CFR Subpart J.

3. Since this comment was submitted, EPA promulgated a final rule implementing 316(b) requirements. Special condition #16 of this permit implements the relevant requirements found at 40 CFR 122.21 and 40 CFR Subpart J.

Additional Monitoring to Support Technology Based Effluent Limitations

The revised draft includes a new Special Condition 24, "Additional Monitoring at Outfall 002". Based on prior communications, it appears that this costly two-year long data collection effort is intended to support development of 'Best Professional Judgment, Technology Based Effluent' ("TBEL") limits in the next round of permitting. Ameren does not believe this requirement is appropriate, first as it requires extensive monitoring for thirty-five parameters, in the absence of any preliminary data indicating concerns or likely environmental impacts. The department acknowledges this in its current review as only four parameters met your initial TBEL determination of being potential pollutants of concern.

Second, the new monitoring obligations occur during a period of transition in the operations of the ash ponds (the source of Outfall 002 effluent). The anticipated federal Coal Combustion Byproducts rules as well as the Steam Electric Effluent Guidelines are likely to significantly impact existing operations such that the contributing wastestreams, configuration, and effluent quality may be very different than with the existing operations. In addition, assuming MDNR authorizes the construction of Ameren's planned landfill additional changes to the existing ponds are likely. In light of these expected changes, implementation of new and/or expanded effluent monitoring programs would be premature and would not likely be representative of actual future discharges.

Further, the value of this additional monitoring and the TBEL evaluation it would presumably support, would be minimal in light of EPA's current schedule to comprehensively revise the Steam Electric Effluent Guidelines. The EPA's extensive assessment of our industry far exceeds the resources available to the department and the resulting rules will be implemented during the term of the renewed permit. There is no legitimate reason to expect that the Department's own Best Professional Judgment would reach different conclusions that merit establishment of limitations, other than those finalized by EPA.

Finally, in the event that the data in our next reapplication were to indicate one or more possible pollutants of concern, among the broad set of parameters tested, additional targeted sampling and analysis could be conducted. Such a targeted effort, to provide the additional data necessary to further investigate concerns raised by the initial sampling effort, would be far more appropriate and cost effective. We therefore request you delete Special Condition 24 requiring additional monitoring of Outfall 002.

The department acknowledges that new federal effluent limit guidelines are expected for Stream Electric Generating Plants and may cover discharges from the coal ash pond. The monitoring for boron is being required as they meet the requirements of the Technology Based Effluent determination. The department is required to conduct a technology based effluent determination when EPA has started the process of promulgating effluent guidelines, but not completed it. When the final effluent limit guidelines are established, Ameren can request a modification to the permit to reflect the revised effluent limit guidelines for discharges from coal ash ponds.

The department is required to make a technology based decision on the discharge, which the EPA guidance for technology based effluent limits is based on ten samples, not the one sample used currently in this permit to determine applicability. With the transition to the utility waste landfill that Ameren has submitted a construction permit application on, startup of operations at the landfill would be occurring at about the same time the draft permit begins the expanded sampling of Outfall 002. This permit allows for the modification and removal of this condition if the federal effluent limit guidelines are established and a modification is required for changes in flow, such as the establishment of the landfill. Besides the federal effluent limit guidelines or the technology based effluent limits determination, the department must also consider the water quality standards and what is protective of the receiving stream, the Missouri River.

E-2: Pre-public Notice Draft Comments

Ameren was provided with a pre-public notice version of the permit on November 21, 2014. Ameren provided clarification and typo comments on December 9, 2014 and technical comments on December 17, 2014. Below is a summary of the comments received and the Department's response.

From December 9th correspondence:

1. Typos, consistency of terms, and numbering has been corrected.
2. *Per Section A, Stormwater Outfalls 003-006 are covered by "Benchmarks"... and that the permit does not specify the frequency of sampling (for comparison to the benchmarks); although you clarified that semiannual was intended. Also, we discussed that the SWPPP (per SC #12), included a confusing statement/request: "This must include a list of potential contaminants and an annual estimate of amounts that will be used in described activities."*

   The permit condition has been revised to reflect the semi-annual monitoring requirement that was previously included. For the confusing statement, that statement has been removed from the draft operating permit as it was removed from the Department's draft permit template language.

3. *Section C, Special Condition 10 requires compliance with RCRA and CERCLA. We discussed that this condition would be modified to reference Ameren's documented use of sodium hydroxide and sulfuric acid in excess of the Reportable Quantities and exemption from reporting. See our permit application Attachment E (and similar precedent in other permits, such as Rush Island, MO-0000043, SC#7).*

   The permit condition has been updated to include the following statement, "Ameren is exempt from Clean Water Act, Section 311, reporting for sulfuric acid and sodium hydroxide as per 40 CFR 117.12."

From December 17th correspondence:

1. *We note that there is some inconsistency within the draft regarding timelines for various requirements, with some described in 'days' while others are in 'months'. We ask that months be specified for all such requirements to ensure uniformity.*

   The terminology has been updated to months, except for conditions requiring submittals in timeframes less than a month from an event occurring.

2. *Regarding the Total Residual Chlorine (TRC) monitoring obligations under the "Final Effluent Limits" for Outfall 02A (on page 5 of the draft permit); Ameren has elected to install UV disinfection technology on the STP and thus will not be adding chlorine. Therefore, we request deletion of the TRC monitoring requirements and Note 7, as neither of these requirements is relevant for facilities using UV disinfection.*

   The references to total residual chlorine for disinfection have been removed.

3. *Regarding the Chemical Oxygen Demand (COD) monitoring obligations for Outfalls 002 and 009, (on page 6 of the draft permit); to the extent that the proposed requirements are based on the TBEL analysis (in Appendix C of the Fact Sheet), they do not appear justified as noted in Table 1. If, alternatively they are based on some sort of general guidelines for industrial wastewater facilities or intended to provide additional 'baseline' information for further evaluation, we believe the weekly measurement frequency is excessive. We request that the COD monitoring requirements be deleted entirely or at a minimum revised to once per quarter.*

   The COD monitoring requirement for Outfall #002 was reduced to quarterly monitoring. For outfall #009, which is the emergency outfall it remains at once/discharge.

4. *Ameren is concerned that timelines under Special Condition 15 (on page 11 of the draft permit) do not account for possible agency inaction, as do others such as those under Section D, Schedule of Compliance. Thus while MDNR approvals of items like the "Site Characterization Workplan" are required, subsequent implementation dates are linked to the permit issuance date and as a result might require implementation actions with or without receipt of the "required" approvals. We request that timelines for actions conditioned on agency approvals, be linked to the approval dates (which are beyond our control) rather than a fixed schedule based on permit issuance.*

Special Condition #15 is the 316(b) Compliance schedule. The draft permit condition does not include specific approval dates beyond what is in the federal rules in 40 CFR 122.21 and 125.94-98. The Department did not want to specify specific dates in the event the pending lawsuits change or throwout time schedules and then the operating permit may contain requirements that do not match what the federal law requires. The Department is committed to keeping projects and studies moving and to minimize inaction and confusion up front. Also 40 CFR 125.98(c) allows the Department to stagger schedules for upgrades and studies, which the Department will entertain for specific facilities as the development of plans and schedules are developed to meet the 316(b) studies required at Labadie.

5. *Section D, Schedule of Compliance – Thermal Discharge (on page 13 of the draft permit):*
   a. *Regarding 2(c), and the list of study elements, we request the following revisions:*
      i. *In "(1) a population typically characterized by diversity at all trophic levels;" we suggest "substitution of "an aquatic community" for "a population" and*
      ii. *in "(2) the capacity to sustain itself through cyclic seasonal changes;" we suggest insertion of the phrase "of the community" after the word "capacity"*
   b. *Regarding 2(g), we suggest insertion of the word "status" after the word "Annual", thus the sentence would begin with "Annual status reports . . .".*
   c. *We request insertion of the following caveat as a new item "4":*
   "Following completion of these studies and the submittal of a renewal application, Ameren reserves the right to seek a variance from listed thermal effluent limitations. Such variance could include alternative measurement methodologies or criteria, alternative thermal effluent limitations or an alternative schedule to implement physical and/or operational modifications as may be warranted. Based upon the results of the aquatic community studies, Ameren's renewal application submittal and the time necessary for agency(s) review to reach a final determination, the deadline for compliance with the final thermal effluent limitations may be modified accordingly."

   The requested changes were made.

6. *Special Condition 9 (on page 9 of the draft permit) requires monitoring of secondary containment waters, upon release. The focus of this monitoring is unambiguously, to detect the presence of hydrocarbons. Yet the monitoring frequency is unclear; it can be read to be once per quarter – only when the presence of hydrocarbons is indicated (by odor or sheens), or alternatively once per quarter without regard to suspected presence. We believe monitoring should only be required if hydrocarbons are suspected present. We suggest the following revised text: "This water must be tested for Total Petroleum Hydrocarbons (TPH) prior to discharge only when the presence of hydrocarbons is indicated, however when indicated, monitoring shall be conducted at least once per quarter in which such discharges occur."*

   This language has been updated to the most recent draft template language which removes the monitoring frequency.

7. *Finally, we note that the Fact Sheet contains copious details regarding Labadie Plant that are clearly from sources other than the NPDES permit application. Please note that we have not attempted to document the source of this information nor validate its accuracy.*

   The Department acknowledges the fact sheet includes information not included in the Labadie renewal application; however the Department chose to include this information to tell the story of the complexity of the Labadie renewal, other issues that are onsite that may not relate completely to the permit renewal, and to show the interaction and input with other agencies in developing this permit renewal. The renewal attempts to identify where the external information in the fact sheet comes from.

Appendix F: 2013 Public Notice Comments Received

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The draft Operating Permit for Ameren Labadie was previously public noticed in 2013. During the public comment period, comments were received. Anyone wanting copies of comments received may submit a Sunshine request; however the comments are summarized below

1. **Request for a public hearing.** This draft permit is being placed on public notice again at which time additional public input will be gathered.

2. **Request Ameren start groundwater monitoring as soon as possible, not within the timeframe in the draft operating permit.** The department feels it is necessary to complete the detailed site characterization prior to initiating groundwater sampling. The purpose of this delay is to ensure that we gather representative data that can be used to make decisions about the nature and extent of discharges to waters of the state.

3. **Not grant the 316(a) variance.** At this time, the department does not have the information necessary to revoke the 316(a) variance. The department has determined that the appropriate path for updating the temperature requirements in this permit is to apply the previously granted 316(a) effluent limits as interim effluent limits, while Ameren does the required studies for the 316(b) rules in 40 CFR 122.21 and 40 CFR 125.94-98. The Department is providing a ten year schedule of compliance to allow Ameren the time to complete the studies and then to establish the best technology to meet entrainment, impingement and thermal limits. The establishment of interim limits does not limit Ameren from requesting a 316(a) variance in the future. Ameren is being required to conduct additional monitoring and update the thermal study. The department will provide close oversight of the study to ensure the information is collected that is necessary to make a determination on the appropriate temperature or thermal limits upon renewal.

4. **Limit the toxics that Ameren can dump into the Missouri River.** This draft appropriately limits all pollutants that have the potential to exceed Missouri's water quality standards.

5. **Comply with Clean Water Act and issue Ameren a permit that limits its water pollution for the sake of the environmental and public health.** This draft appropriately limits all pollutants that have the potential to exceed Missouri's water quality standards. While there may be discharges of other parameters, the department must follow the Water Quality Standards and the EPA's Technical Support Document when evaluating parameters and assigning water quality based effluent limits.

Appendix G: 2015 Public Comments

Appendix G-1: Public Hearing Comments

The department held a public hearing on February 17, 2015 at the Knights of Columbus Hall in Washington, MO to discuss the draft operating permit. Oral and written comments were accepted. Below is a summary of the comments received related to the Labadie Operating Permit and the department's response.

1. **Effluent Limits on Outfall #002**

   The department reviewed the 1998 and 2011 renewal applications, along with the 1992 and 1987 applications to assess effluent variability. The existing ash ponds have a long detention time. The new ELG that is expected in September 2015 is expected to further set up new paths for handling and operations of coal. The operating permit in Appendix D includes a comparison of the discharge reported, the water quality standard, and what the effluent limit would be for the parameters identified. The chart shows that the discharge amounts from the ash pond are well below the applicable effluent limits.

2. **Groundwater Monitoring around Ash Ponds**

   The permit condition was changed to require groundwater monitoring around both ash ponds to evaluate the potential of discharges to groundwater, which is a water of the state. This permit is to comply with the requirements in 644.143 RSMo and to establish a long term approach and stewardship of the site and the beneficial uses of the groundwater on this site. This permit does not implement the federal CCR rule, as that is a self-implementing rule and covered under RCRA. This permit does not shield a facility from the CCR requirements.

   The groundwater monitoring requirements of this permit are separate and in addition to the requirements established under the Resource Conservation and Recovery Act in 40 CFR 257. These requirements are included in accordance with 10 CSR 20-7.015(7). The additional requirements include the cooperative development of a Detailed Hydrogeologic Site Characterization and long-term Groundwater Monitoring & Sampling Plan (GMSAP). These requirements are intended to be concurrent with, not in replacement of, the requirements of 40 CFR 257. Nothing in this permit prevents the permittee from installing wells and conducting monitoring in the timeline required by 40 CFR 257, nor does the schedule in this permit supercede any deadlines established by 40 CFR 257. The purpose of these additional requirements is to ensure that complex hydrogeological settings are accurately characterized to ensure that the long-term GMSAP is effective for determining compliance with 10 CSR 20-7.015(7) and water quality standards 10 CSR 20-7.031.

3. **Stormwater Benchmarks**

   The department has returned the monitoring frequency to quarterly. However the department is not specifying which month in the quarter the sample should be collected in like the previous permit did.

   The establishment of daily maximum benchmarks for Outfall #003-#006 is to meet the goals of EPA's memo and provide clear, specific and measurable elements for BMP installation and supports an adaptive management approach to meeting water quality at a large industrial facility, as discussed in EPA's November 26, 2014 Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on those WLAs" Memo:

   "Permits should contain clear, specific, and measurable elements associated with BMP implementation (e.g., schedule for BMP installation, frequency of a practice, or level of BMP performance), as appropriate, and should be supported by documentation that implementation of selected BMPs will result in achievement of water quality standards. Permitting authorities should also consider including numeric benchmarks for BMPs and associated monitoring protocols for estimating BMP effectiveness in stormwater permits. Benchmarks can support an adaptive approach to meeting applicable water quality standards. While exceeding the benchmark is not generally a permit violation, exceeding the benchmark would typically require the permittee to take additional action, such as evaluating the effectiveness of the BMPs, implementing and/or modifying BMPs, or providing additional measures to protect water quality."
   (http://water.epa.gov/polwaste/npdes/stormwater/upload/EPA_SW_TMDL_Memo.pdf)

4. Thermal Discharge

This permit does not regrant the thermal variance. It instead establishes interim effluent limits to meet the department's water quality standards in ten years. The interim effluent limit is the existing 11.16 x10^9 btus/hr thermal discharge limit on Outfall #001 previously granted with the approval of the 316(a) variance; however monitoring is required of the stream and the effluent temperature and flow to be used in conjunction with the biological studies to establish the appropriate temperature and/or mixing zones for the Labadie Energy Center for compliance with Missouri's water quality standards. The previous permit contained a condition to report when the thermal discharge exceeded the change in temperature by more than 5°F. However, the condition was not applied correctly as it was tracking exceedance, not actual change in temperature. The exceedance of the change in temperature requirements applies to thermal discharges on the Mississippi River, not the Missouri River. The previous permit did not require temperature monitoring upstream of the discharge to track the change in temperature.

The department is allowed to set interim effluent limits under 40 CFR 122.47 and 10 CSR 20-7.031(10) for water quality standards. Ameren has never had the 90° F water quality standard in their permit, which allows the Department to issue a schedule of compliance to obtain the standard. Under Ameren's previous permits the water quality standard was the variance granted limits.

5. Publicly available reporting

Under the Coal Combustion Rule, Ameren is required to post the groundwater data they collect from around the ash ponds. From the department's side, all information submitted is available through a freedom of information request, [HYPERLINK "http://dnr.mo.gov/sunshinerequests.htm"]. The department is working on an enhancement to the department's database to allow discharge monitoring reports to be publicly available for searching, but that is still being developed.

Appendix G-2: Washington University Comments

Comment #1: The draft permit would unlawfully renew the Labadie Plant's thermal discharge variance.

Response #1: The draft permit does not propose a reissuance of the 316(a) variance and instead includes a schedule of compliance with interim and final limits. The Department of Natural Resources concurs that Ameren did not demonstrate that applicable limits are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of fish and wildlife in the Missouri River. In absence of a federally mandated technology based effluent limitation, the department is implementing the applicable water quality standard found in 10 CSR 20-7.031. The department is not reissuing the 316(a) variance thermal limits, but instead is requiring the discharge comply with interim effluent limits equal to the previous thermal discharge effluent limit. The thermal discharge interim effluent limit is the existing 11.16 x10^9 btus/hr on Outfall #001 which was previously granted with the approval of the 316(a) variance. The final effluent limit is a water quality standard of 90°F, which was never previously established as a permit condition. Additionally, the permit requires stream monitoring and effluent temperature and flow monitoring. This data will be used in conjunction with the biological studies to establish the appropriate temperature and/or mixing zones for the Labadie Energy Center for compliance with Missouri's water quality standards. The permittee also retains the ability to request a 316(a) thermal variance in the future. If Ameren chooses to request a new variance, the department will carefully weigh all of the required factors including a balanced, indigenous population and cumulative effects of the discharge.

The assumption that the Missouri River's complete biological indigenous community is present in the Missouri River at the Labadie Energy Center is inaccurate. The lower Missouri River and the middle Missouri River have many fish species that utilize large areas and habitat to meet their life cycle needs, including spawning, rearing, feeding, and over-wintering. The habitat surrounding Labadie may support different fish species with year-round residency, a season migration route, or no support at all because of naturally limiting features such as flow velocity, depth, substrate, ambient temperature, cover, or the absence of forage.

In evaluating ecological communities, a species-accumulation curve is used to depict the increasing number of species recorded in a specific environment as a function of the cumulative sampling effort. This effort applies in defining the biological indigenous community based on comparing the catch at differing locations that may have similar species composition but different effective sampling efforts. Comparing total counts and individual species caught and identified by the different studies and surveys on the lower rivers can be misleading because of the differing vulnerability of species to the various sampling gear types and configurations, the level of the sampling effort, the time of sampling and the different habitat features sampled. In the U.S. Environmental Protection Agency's (EPA) draft 316(a) guidance, EPA recognized the difficulty of evaluating the entire community and all member species and the solution EPA established was the Representative Important Species with the assumption that if the Representative Important Species are doing well, the entire biological community should be as well.

Cumulative impacts of the Labadie thermal discharge will be addressed in the next permit renewal. Among potential cumulative stressors, the analysis would include synergistic effects between temperature and water or sediment contaminants, other heat sources, habitat modifications and altered annual flow regimes. Habitat modifications and altered flow regimes have been previously identified as constraints to recovery of native species. EPA's definition of biological indigenous community recognizes that the presence or absence of some species may reflect man-induced changes in the system; which for the lower Missouri River would include damming of the upper river reaches, the effects of flow regulations, channelization, reductions in off-channel areas, islands, floodplain inundation, turbidity, silt load, and increased velocity. Coordination of the 316(a) and 316(b) studies as this permit lays out will facilitate the evaluation of the cumulative effects of the thermal discharge co-occurring with entrainment and impingement of the river's biota.

The decision for interim effluent limits is a best professional judgment decision. The department is allowed to set interim effluent limits under 40 CFR 122.47 and 10 CSR 20-7.031(10) for water quality standards. Ameren has never had the 90° F water quality standard in their permit, which allows the department to issue a schedule of compliance to meet the standard.

The department disagrees that a ten year schedule of compliance is invalid. The Clean Water Act limits the duration of a permit, but only requires compliance with final limits as soon as possible. The ten year schedule of compliance was based on a number of considerations, including that Ameren is required to conduct biological monitoring for thermal impacts, as well as biological monitoring and an engineering analysis for upgrades to the intake structure. Recent amendments to 40 CFR 122 require permittees to conduct an engineering analysis that considers closed cycle cooling and submit the results with the next permit renewal application. At the next permit cycle, the department will make a decision on what represents the best available technology for the Labadie facility based on the studies completed by Ameren, which will be peer reviewed, and evaluated by the department, EPA, and the U.S. Fish and Wildlife Service. Following the selection of the technologies for the intake structure, additional time is necessary for design and construction of upgrades. The ten year schedule provided in the permit, allows Ameren to make one comprehensive decision and upgrade simultaneously to address thermal discharges as well as impingement and entrainment of aquatic life. The department believes this is the most efficient, effective and economic approach to achieving compliance with §316 of the Clean Water Act. This approach is also consistent with the timelines recently established by the EPA in 40 CFR Parts 122.21 and 125 Subpart J to fully implement §316(b) requirements.

Comment #2: The draft permit violates the Clean Water Act's anti-backsliding prohibition because it replaces a permit that requires compliance with water quality standards for temperature with a permit that does not.

Response #2: The department disagrees that the draft permit violates the anti-backsliding conditions because this permit corrects a technical mistake made in the 1994 version and still protects water quality standards, both the specific and general criteria. The department acknowledges that the following statement was removed from this renewal – "Water temperatures and temperature differentials specified in Missouri Water Quality Standards shall be met." However, the renewal does contain an updated version of this statement under Special Condition #7. Water Quality Standards (a) – "To the extent required by law, discharges to waters of the state shall not cause a violation of water quality standards rule under 10 CSR 20-7.031, including both specific and general criteria."

The previous permit contained a condition to report an estimate of the percentage of the stream flow in excess of 5°F temperature increase, based on heat rejection and river flow. These estimates were not based on upstream river temperature nor Outfall #001 effluent temperature or flow. While Missouri's thermal water quality standards are referenced in the current permit, the existing limits issued pursuant to the 316(a) variance, were found to be protective of aquatic life and provide relief from both effluent temperature limits and otherwise applicable water quality standards.

This permit also contains a general reference to water quality standards. The interim effluent limits provide the same level of protection as the existing permit, until the final effluent limits are implemented at the end of the schedule of compliance. The schedule of compliance is appropriate for achieving compliance with the 90°F, as the previous permit did not contain that limit. This permit also requires extensive studies to re-evaluate the extent of the thermal impacts.

The previous permit contained a condition to report when the thermal discharge exceeded the change in temperature by more than 5°F; however, the condition was not applied correctly as it was tracking exceedance, not actual change in temperature. The exceedance of the change in temperature requirements of the previous permit applied to thermal discharges on the Mississippi River, not the Missouri River.

Comment #3: The draft permit fails to ensure that Ameren will timely upgrade its cooling water structure and fails to protect endangered species.

Response #3: The department disagrees that the draft permit fails to protect for endangered species and for upgrades to the cooling water intake structure. The permit directly incorporates the requirements of 40 CFR 122.21 and 40 CFR 125 Subpart J. The draft permit specifies annual progress reports and a schedule to submit the required information at renewal. Expectations established in federal rule clearly provide the permittee time to collect the specified information to determine what upgrades are necessary. The schedule of compliance to install best technology available for impingement and entrainment will be established in the permit after the department receives and reviews the application materials required by rule.

The department does not think it prudent to specify the information required in the annual reports. This decision is based on the history of litigation surrounding 316(b) regulations. Previous regulations have been issued and remanded, which ultimately led to significant changes in the biological data the facility is required to collect. The department believes that language is consistent with all of the federal requirements while allowing some flexibility in response to possible regulatory changes. This approach is meant to ensure that progress toward protecting endangered species at this facility proceeds in spite of ongoing regulatory uncertainty.

The department concurs that required Endangered Species Act language was left out of the draft permit in error. The department has updated the permit to include the "take" language specified in 40 CFR 125.98(b)(1). Special Condition #4 now includes "Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act."

Comment #4: Groundwater monitoring requirements in the draft permit do not fulfill the department's obligations to protect subsurface waters and are less stringent than the new EPA regulations for coal combustion residuals (CCR).

Response #4: The department disagrees that the groundwater monitoring requirements do not fulfill the department's obligations to protect subsurface waters. This permit is issued under the authority of the Clean Water Act National Pollutant Discharge Elimination System program and

Missouri Revised Statutes Chapter 644. It is neither necessary nor appropriate to incorporate rules promulgated under the Resource Conservation and Recovery Act (RCRA) in 40 CFR 257. The groundwater monitoring requirements of this permit are separate and in addition to the requirements established under the RCRA in 40 CFR 257.

Additional requirements are included in accordance with 10 CSR 20-7.015(7). The additional requirements include the cooperative development of a Detailed Hydrogeologic Site Characterization and long-term Groundwater Monitoring and Sampling Plan (GMSAP). These requirements are intended to be concurrent with, not in replacement of, the requirements of 40 CFR 257. Nothing in this permit prevents the permittee from installing wells and conducting monitoring in the timeline required by 40 CFR 257, nor does the schedule in this permit supersede any deadlines established by 40 CFR 257. The purpose of the requirements are to ensure that complex hydrogeological settings are accurately characterized to ensure that the long-term GMSAP is effective for determining compliance with 10 CSR 20-7.015(7) and water quality standards 10 CSR 20-7.031. This permit establishes a long term approach to stewardship of the site and the beneficial uses of the groundwater on this site. This permit does not implement the federal CCR rule, as it is a self-implementing rule and covered under RCRA. This permit does not shield a facility from the CCR requirements.

The Water Protection Program agrees that the conditions regarding CCR impoundments should be consistent with §40 CFR 257 where possible. The public noticed draft permit only required groundwater monitoring around the unlined ash pond. The permit has been revised to include monitoring of the lined CCR impoundment as well. Additionally, Special Condition #15 has been revised to provide additional consistency with the requirements of §40 CFR 257.

Comment #5: The BAT analysis and BPJ determination for the ash pond discharge are incomplete and allow the ash pond effluent to remain untreated.

Response #5: The department disagrees that the BAT analysis and BPJ determination are incomplete. Boron was the only parameter identified above that needs to go through the technology based effluent process, as required in 40 CFR 125.3. The evaluation of technologies focused on the removal of boron; currently the best available technology does not remove boron but merely concentrates the boron into another waste stream. The concentrate stream creates an even more formidable disposal problem. Cost associated with this disposal will be prohibitive.

Conversion to dry handling is the long-term plan already identified by Ameren with their plan to construct a utility waste landfill and with the changes required to the process under the CCR, 40 CFR 257, and with the proposed revision to the Steam Electric Generating Effluent Limit Guideline, 40 CFR 423. Additionally, the chosen option for the Effluent Limitation Guideline (ELG) is expected to address the cumulative impacts of metals on all aquatic life, including threatened and endangered species.

Over this permit cycle, the proposed landfill will allow Ameren to transition to dry handling and begin the process for closure of the ash ponds. The department reviewed the 1998 and 2011 renewal applications, along with the 1992 and 1987 applications to assess effluent variability. The existing ash ponds have a long detention time. Additionally, the proposed ELG, due to be finalized in September 2015, is expected to establish national requirements for handling and operations of coal. The operating permit in Appendix D includes a comparison of the discharge reported, the water quality standard, and what the effluent limit would be for the parameters identified. The chart shows that the discharge amounts from the ash pond are well below the applicable water quality based effluent limits.

The BAT analysis did not consider flows of leachate and stormwater from the proposed landfill because Ameren has modified their plan for handling these flows. Currently Ameren does not intend to discharge leachate or landfill stormwater to the CCR impoundments. If these flows are diverted to the impoundment in the future, modification of the permit is required. The BAT analysis and BPJ determination would be modified at that time.

There was limited data available to conduct the BAT analysis and BPJ determination. This permit was revised to require additional monitoring at Outfall #002 if the revised 40 CFR 423 effluent limit guideline is not finalized within a year of permit issuance. The requirement will provide enough data points to conduct a reasonable potential analysis and update the best technology analysis in Appendix C during renewal.

Comment #6: The draft permit removes effluent limitations and reduces monitoring requirements for stormwater outfalls, in violation of the Clean Water Act's prohibition on anti-backsliding.

Response #6: The department disagrees that the stor mwater benchmarks established are a violation of the anti-backsliding provisions. The department revised the permit to require quarterly stormwater monitoring; however, the department is not specifying which month in the quarter the sample should be collected as the previous permit did.

Under the anti-backsliding requirements, the department determined that technical mistakes or mistaken interpretations of law were made in issuing the previous permit under section 402(a)(1)(b). The previous permit limits were established in error, based on limits for other industrial facility discharges. This renewal establishes limits appropriate for stormwater discharges. There will be no changes to industrial activities onsite or the composition of the stormwater discharge as a result of this renewal. The benchmark concentrations and required corrective actions are protective of the applicable water quality standards.

The decision to establish daily maximum benchmarks for Outfall #003-#006 is supported by EPA's November 26, 2014 memorandum "Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm water Sources and NPDES Permit Requirements Based on those WLA" and provides clear, specific and measurable elements for best management practices (BMP) installation and support of an adaptive management approach to meeting water quality at a large industrial facility. The memorandum states the following:

"Permits should contain clear, specific, and measurable elements associated with BMP implementation (e.g., schedule for BMP installation, frequency of a practice, or level of BMP performance), as appropriate, and should be supported by documentation that implementation of selected BMPs will result in achievement of water quality standards. Permitting authorities should also consider including numeric benchmarks for BMPs and associated monitoring protocols for estimating BMP effectiveness in stormwater permits. Benchmarks can support an adaptive approach to meeting applicable water quality standards. While exceeding the benchmark is not generally a permit violation, exceeding the benchmark would typically require the permittee to take additional action, such as evaluating the effectiveness of the BMPs, implementing and/or modifying BMPs, or providing additional measures to protect water quality." ([HYPERLINK "http://water.epa.gov/polwaste/npdes/stormwater/upload/EPA_SW_TMDL_Memo.pdf"])

The establishment of benchmarks requires the facility to take corrective action and make changes to the BMPs and the Stormwater Pollution Prevention Plan (SWPPP) with any exceedances of the benchmark. This will improve stormwater discharges from the site by requiring immediate improvements to BMPs. The requirement for the SWPPP, BMPs, and the benchmark values are more protective than numeric stormwater effluent limitations in the current operating permit. While a single exceedance of a daily maximum benchmark may not trigger a violation, it does trigger a mandatory response action and should the exceedance continue result in enforcement action. This permit includes chemical oxygen demand, which the previous permit did not contain. The settleable solids benchmark was reduced from a daily maximum of 2 mg/L to 1.5 mg/L with a trigger if exceeding the 1.5 mg/L.

The removal of monitoring from Outfall #007 meets EPA's "Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits," given it is stated that "If the permitting authority determines that, through implementation of appropriate BMPs required by the NPDES stormwater permit, the discharges have the necessary controls to provide for attainment of WQS and any technology-based requirements, additional controls need not be included in the permit".

Outfalls #007 and #008, are required to be permitted as indicated by 10 CSR 20-6.200(2)(B)3, "Facilities which meet the following definitions are considered to be included in this subsection:…D. Steam electric power generating facilities, including coal handling sites." The permit requirement references back to 10 CSR 20-6.200(2)(A) including immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility. With this requirement, Outfalls #007 and #008 were established in previous permits and do not qualify for no exposure. Because of the BMPs installed on-site and the exemption allowed for by 10 CSR 20-6.200(1)(B)2 for areas located on plant lands separate from the plant's industrial activities, the permit writer's best judgment was to require the outfalls to be addressed in the facilities SWPPP, that the BMPs be maintained, and that monitoring would not be required this permit cycle per 10 CSR 20-6.200(6)(B).

Additionally Outfalls #007 and #008 were removed from monitoring, as the outfalls are located at the plant's entrance, not located near plant operations, have BMPs installed, and in review of the discharge monitoring report data available are often at or below the detection level of the test methods. The outfalls are still required to be included in the SWPPP and sampled prior to reapplication at renewal. If there is a change in operations that would affect Outfalls #007 and #008 or the drainage area to Outfalls #007 and #008, benchmarks and monitoring will be reevaluated. Furthermore, an evaluation of the previous permit indicates that Outfall #008 did not have monitoring requirements in the past.

Appendix H: TBEL determination for Once-Through Cooling

Figure 1: Summary of Factors in Case by case TBEL development

For BPT requirements (all pollutants)
- The age of equipment and facilities involved*
- The process(es) employed*
- The engineering aspects of the application of various types of control techniques*
- Process changes*
- Non-water quality environmental impact including energy requirements*
- The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application

For BCT requirements (conventional pollutants)
- All items in the BPT requirements indicated by an asterisk (*) above
- The reasonableness of the relationship between the costs of attaining a reduction in effluent and the derived effluent reduction benefits
- The comparison of the cost and level of reduction of such pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources

For BAT requirements (toxic and non-conventional pollutants)
- All items in the BPT requirements indicated by an asterisk (*) above
- The cost of achieving such effluent reduction

1. Age of Equipment

The Labadie Energy Center (Labadie) consists of four generating units with a net capability of 2,407 megawatts (MW). The first unit started operating in May 1970 and the plant was fully operational in June 1973. The typical annual generation capacity is between eighteen and nineteen million megawatt hours (18,000,000-19,000,000 MWHR). Labadie was designed as a once-through base load plant with once-through cooling. The original NPDES operating permit was issued October 3, 1975 with temperature limit of 118°F.

The permit, which established the alternate limit of 10.63 $x10^9$ btus/hr as an effluent limit and the 316(a) variance was issued July 15, 1977. The 316(a) variance was recommended for approval by EPA on February 14, 1977. Along with the alterative effluent limit, the temperature requirement of 118° F and the special condition requiring off stream cooling was removed, as the federal rule requiring cooling towers as best available technology was remanded by the Fourth Circuit Court of Appeals for further consideration in 1976.[1]

The plant's cooling water intake structure was constructed at the time of the building of the plant and is located along the Missouri River shoreline and consists of four cells, one for each unit. Within each cell are 2 bays containing a 10 foot wide vertical conventional traveling screen for a total of eight traveling screens for the entire intake. There is a ten foot wide by nine foot high upper opening and a nine foot wide by seven foot high lower opening to each bay. At the mouth of the opening there are steel trash racks made of bars with 2.5 inch clearing spacing. The intake is equipped with a mechanical rake to clear debris from the trash racks.[2]

The traveling screens have ½ inch woven wire mesh and are operated once per 8 hour shift for 1.25 revolutions at 5 feet per minute (fpm). If a 6 inch head differential occurs, the screens automatically will rotate at 20 feet per minute until the head differential is reduced to 4 inches, after which the rotation speeds reduce to 5 fpm. [2]

The cooling water is passed through condensers and other heat exchangers and is discharged to the Missouri River. The water is discharged through an 8 foot diameter pipe leading to a seal well, where the water flows over a weir into a 0.22 mile discharge canal located downstream from the intake structure. A warming line recirculates heated water back to the intake to prevent ice buildup in the winter. [2]

The intake structure is designed to withdraw 1438 million gallons per day (MGD) of water and averages 966MGD. In review of the historic discharges through Outfall #001, the discharge flows have remained fairly consistency in the 960 MGD withdrawal.

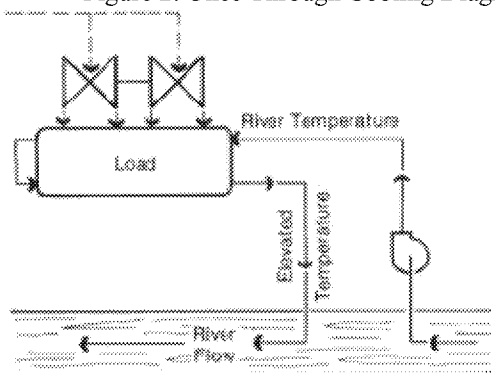
2. Process Employed

The current process employed is once-through cooling. The plant's cooling water intake structure is located along the Missouri River shoreline and consists of four cells, one for each unit. Within each cell are 2 bays containing a 10 foot wide vertical conventional traveling screen for a total of eight traveling screens for the entire intake. There is a ten foot wide by nine foot high upper opening and a nine foot wide by seven foot high lower opening to each bay. At the mouth of the opening there are steel trash racks made of bars with 2.5 inch clearing spacing.

The heated water is discharged through an 8 foot diameter pipe leading to a seal well, where the water flows over a weir into a 0.22 mile discharge canal located downstream from the intake structure. A warming line recirculates heated water back to the intake to prevent ice buildup in the winter.[2]

Once through cooling provides the best power plant efficiency of the alternatives as the source water tends to be the lowest temperature heat sink available for most of the year. Below in Figure 2 is a diagram of how once through cooling works.

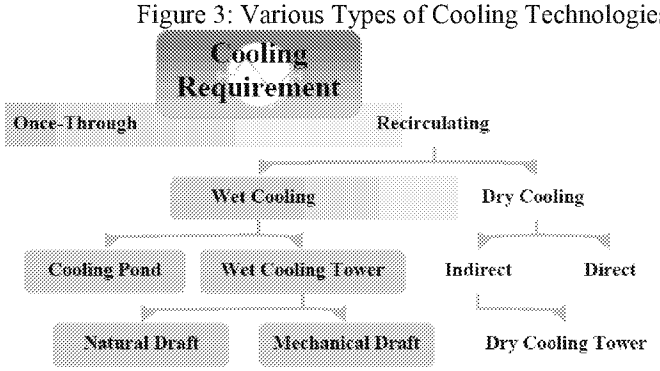
Figure 2: Once Through Cooling Diagram[3]



3. Engineering Aspects of application of various types of control techniques

While the potentially available cooling technologies that may be employed at any given facility are generally well established, their suitability and successful application at individual facilities is strongly dependent on the site specific conditions associated with each facility. In Figure 3, the most common technologies are presented.

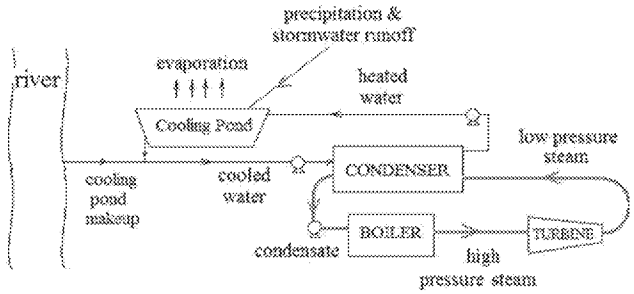
Figure 3: Various Types of Cooling Technologies



- **Once-through Cooling Systems**: Once-through systems take water from nearby sources, such as the Missouri River, circulate it through pipes to absorb heat from the steam in systems called condensers, and discharge the then warmer water to the local source. Once-through systems were initially the most common cooling technology because of their simplicity, efficiency, low cost, and the possibility of siting power plants in places with abundant supplies of cooling water. See Figure 2 above for how a once-through cooling system operates.

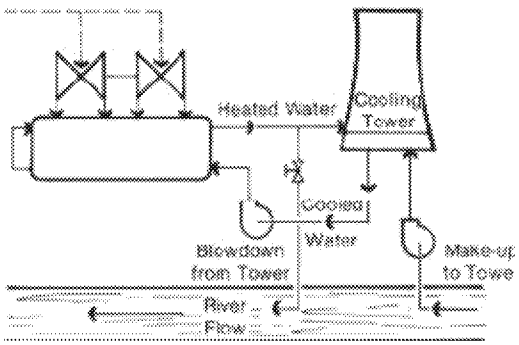
- **Cooling Ponds:** Cooling Ponds typically consist of artificially constructed bodies of water-which may be created by damming a natural stream, utilizing an existing impounded body of water, or creating a new impoundment. The condenser water is fed into the cooling pond or lake, cooled through evaporation and then typically recycled to the condenser. While such ponds and lakes are established technologies at Missouri power plants, they have not been established for power plants located in the Missouri and Mississippi River floodplains. Figure 4 is an example of how a cooling pond works.

Figure 4: Cooling Pond[4]



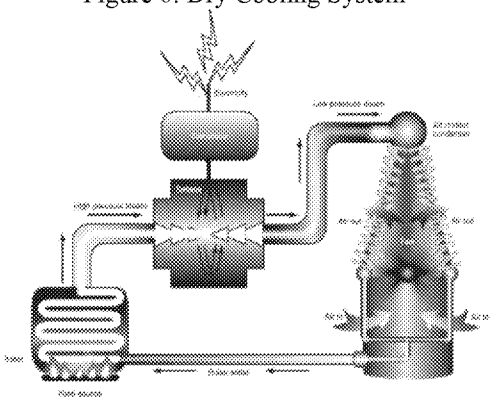
- **Wet Closed Cycle Cooling Systems:** A closed-loop cooling system is designed to minimize the amount of water withdrawn from the river. In a wet closed cycle cooling system, condenser water still exchanges heat with water in a heat exchanger, however the cooling water is recycled between a cooling tower and a heat exchanger. In this system, the cooling water is cooled by evaporating a percentage of the water to the environment and requires make-up water to account for the consumed water. In the case of the Labadie Energy Center, the make-up water would come from the Missouri River. Wet closed cycle cooling systems consume much more water than once-through cooling systems as the entire energy exchange is through evaporation of the water—a consumptive use-however wet closed cycle cooling systems withdraw much less water than once through cooling systems. Wet closed cycle cooling systems can use natural draft or mechanical draft to accomplish cooling.

Figure 5: Closed Cycle Cooling Tower[3]



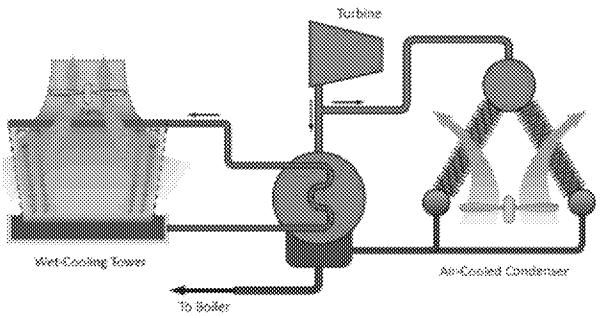
- **Dry Closed Cycle Cooling Systems:** Dry cooling systems rely on air flow in cooling towers rather than water to cool the steam produced during electricity generation. Steam from the boiler is routed through a heat exchanger. Air is blown across the heat exchanger to condense the steam back into liquid, which is then returned to the boiler and is reused. Plants using dry cooling withdraw and consume a small amount of water to maintain and clean the boiler, including replacing boiler water lost through evaporation. Dry cooling has a higher capital cost than wet cooling, reduces the overall efficiency of the power plant, and does not operate effectively at high temperatures. Installation of dry cooling is more common on new plants-as a retrofit to an existing plant, this option is more complex and expensive. Existing plants originally designed for once-through cooling are equipped with older turbines with much more stringent limitations on exhaust pressure than those for modern turbines designed for use with dry cooling.[5]

Figure 6: Dry Cooling System[6]



- **Hybrid Cooling Systems:** This option is a combination of the wet and dry cooling systems, where a condenser runs with an air-cooled condenser. This process combines-two established cooling processes, uses the advantages of dry and wet cooling by reducing water consumption compared to wet cooling, and does not require-an air cooled condenser as large as may otherwise be needed.

Figure 7: Hybrid Cooled System[7]



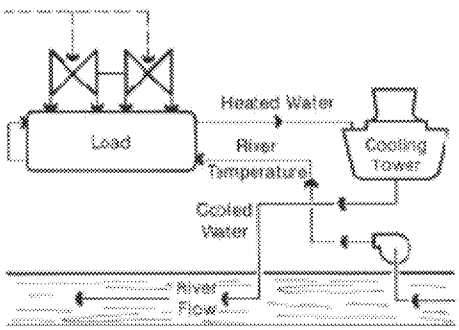
The closed cycle cooling system is required to be evaluated under the 316(b) requirements with a recommendation and engineering analysis due January 2024.

The most common option available for replacing a once-through cooling system is a closed cycle cooling system.

- **Mechanical Chillers:** Mechanical Chillers operate with heat exchangers and pumps to control the temperature of the discharge. Mechanical chillers work best when the temperature reduction and volume is lower than that which is discharged from the Labadie Energy Center.

- **Helper Cooling Systems:** Helper cooling systems supplement an open-cycle cooling system by removing a portion of the heat in a plant's effluent before discharge to the receiving water. Heat is transferred directly to the atmosphere. This could perhaps be accomplished, at least conceptually, via routing of the plant's heated effluent (before discharge) through a cooling tower (see Figure 8) or a cooling pond.

Figure 8: Helper Cooling Tower System[3]



4. Process changes

The consideration of process changes includes changes at the existing facility that could be modified to improve the system. This includes changes from operations and maintenance to a complete retrofit of the entire system.

- **Once-through cooling** is the technology currently in use. Once-through systems are less expensive to build than closed cycle systems, which have a greater infrastructure requirement (e.g., construction of a cooling tower or cooling pond). Once-through systems consume less water than closed cycle cooling systems. Although once-through cooling systems withdraw a greater amount of water, essentially all of it is returned to the water source.

- **Cooling Ponds** are an established technology in Missouri for plants located in watersheds with small streams that can be dammed to create a cooling pond, such as in Springfield or outside Montrose, MO. Such is not the case in the Missouri River floodplain. The Missouri River is controlled by the US Army Corps of Engineers and

establishment of a large dam to operate as a cooling pond would jeopardize other uses of the Missouri River including navigation, flood control, and the repropagation of species. Labadie Creek is a small stream located near the power plant; however damming it to create a cooling pond is not feasible as it is heavily influenced by the Missouri River, acts as backwater flood area, and the watershed draining to the creek is not large enough to support a cooling pond necessary to serve Labadie's water needs. Also, by damming Labadie Creek to create a cooling pond, farmland would need to be bought and flooded. Creation of a cooling pond would require retrofitting the existing plants piping, controls, and operations. Additional permitting would be required from the Department's Water Resources Center and the US Corps of Engineers 401/404 program. Portions of Labadie Creek would need to be excavated and covered with lake water thus eliminating the designated uses of impacted portions of water of the state. Water requirements for pond cooling systems are typically higher than tower systems and are much more variable, as they can be operated as systems that resemble recirculating closed system and a once-through system which impacts the water withdrawal and consumption rates.

- **Closed Cycle Cooling Towers**: Recirculating systems only withdraw enough water needed to maintain the required water level of the system, but they consume water through evaporation. To build a wet or hybrid cooling system, a water treatment plant would need to be constructed to clean the Missouri River to the level to be used and recirculated through the plant. The retrofit installation of closed-cycle cooling at a plant originally built with once-through cooling is complex. It is not simply a matter of installing a cooling tower in the existing circulating water system for several reasons. Often the plan is to keep the existing condenser, circulating water flow rate and as much of the existing circulating water pumps, lines and intake/discharge structure as possible unchanged. The site-specific considerations are dependent on a number of variables, including:
    1. A suitable location with enough room for the tower must be found on or adjacent to the plant site. This may place the tower far from the turbine hall and require very long circulating water lines.
    2. The discharge head from the circulating water pump must be increased in order to get the water to the top of the cooling tower and to overcome any additional head loss in the new circulating water lines.
    3. This additional head may be obtained by replacing or modifying the existing pump to obtain higher discharge head. This would involve diverting the condenser discharge flow from its current route, installing a new line to the cooling tower and a new return line back to the existing intake. Additionally, new make-up and blowdown lines and pumps would need to be installed as described above for new installations.
    4. The existing inlet and discharge structures will have been designed for much higher flows than will be experienced with the closed-cycle system. This may lead to silting or fouling and will require either that they be modified to restrict the flow area or be replaced with smaller, more suitable structures.
    5. With this approach, the pressure in the condenser water boxes and any remaining discharge lines from the existing condenser will be subject to much higher pressure. This may require reinforcement or replacement in order to avoid leakage or damage.[5]
    6. Wet and hybrid cooling systems introduce additional chemicals to the system to prevent fouling and scaling of the system. While heated water discharges would decrease, additional heat would be released to the atmosphere.

- **Mechanical Chillers** operate with heat exchangers and pumps to control the temperature of the discharge. Mechanical chillers work best when the temperature reduction and volume is lower than what is discharged from Labadie Energy Center. Corrosion protection chemicals would also be required. The installation of mechanical chillers would require energy to operate, still have the large withdrawal of water from the river, would transfer the heat from the water to the atmosphere, addition of concerns with clogging and flooding due the Missouri River's operation and flow.

- **Helper Cooling Systems**: Helper cooling systems are another technological alternative for reducing a plant's thermal discharges. These systems supplement an open-cycle cooling system by removing a portion of the heat energy discharged in a plant's effluent and transferring it directly to the atmosphere. Ameren estimated the cost of constructing a helper cooling tower at $112 million.[8] The construction of a helper cooling tower, pond, spray modules or other technique will still have the impact to aquatic life on the intake structure with impingement and entrainment, it will still have water with high temperature being discharged, it will require retrofits to the existing system resulting in a loss of energy production, it will introduce additional chemicals to the process to prevent fouling and scaling, it will put more heat into the atmosphere.

Under the 316(b) requirements, Labadie is required to evaluate the installation of closed cycle cooling for reductions to the impingement and entrainment in the intake structure; however the installation of the closed cycle system would address the discharge of heated water back to the Missouri River.

5. Non-water quality environmental impacts including energy requirements

All cooling technologies have non-water quality environmental impacts, including impacts to energy requirements. Because impacts at the Labadie Energy Center would entail a retrofit, the non-water quality impacts would include changes to the existing system, which could result in energy production loss.

- Once-through cooling is the existing installed technology. Non-water quality impacts include the impact of the intake and the discharge on aquatic communities. Intake impacts are to be evaluated under CWA Section 316(b).

- Cooling Pond construction would entail non-water quality and water quality impacts. Construction of a cooling pond would require retrofitting the existing facility, construction of a pond, which would require the removal of existing farmland and flood control structures. While a cooling pond would not entail direct thermal discharges to the river, the heat would yet be discharged to the environment.

- Closed-Cycle Cooling Tower construction would require additional land acquisition which would remove farmland from use. Additionally, cooling tower construction would require retrofitting of the intake structure and plant operations. Other anticipated impacts include the necessity to build a water treatment plant to clean the water for usage. Building a water treatment plant similar to what is at Ameren Callaway would introduce additional wastestreams and pollutants to be handled and potentially discharged. Cooling tower retrofits will require substantial engineering, design and construction, including replacement of condensers. Cooling tower installations would be anticipated to increase parasitic load requirements and decrease overall Labadie Energy Center efficiency.[8] Closed cycle cooling towers may further require replacement of turbines and other equipment, plus changes in piping and handling methods of waste streams. A retrofitted cooling system of either the wet or dry type would have a deleterious effect on the plant's net heat rate and generating efficiency. If a wet cooling system, the power requirements will be higher than the current pumping power requirements for the once-through system. This power is used for the additional circulating pumps and for the cooling tower fans and represents power that must be generated but cannot be sold. Also, the plant will operate at a higher backpressure and therefore a higher heat rate with closed cycle cooling, which is more pronounced for a dry system than for a wet system.[5] Closed cycle cooling would also require changes in outages of power from once every three years currently to a more frequent for cleaning and maintenance. Finally, closed cycle cooling would increase the heat released to the atmosphere and a potential increase in greenhouse gases.

- Mechanical Chillers operate with heat exchangers and pumps to control the temperature of the discharge. Corrosion protection chemicals would be required and would entail energy to operate. Mechanical chillers would also include large river water withdrawals and the transfer the heat from processed water to the atmosphere. While mechanical chillers are sometimes used elsewhere in the Midwest, the usage at such a large power plant (such as the Labadie Energy Center) on a large river subject to Corps of Engineers jurisdiction, fluctuating river levels and flooding would limit the effectiveness of this technology.

- Helper Cooling Systems construction would have many of the similar non-water quality impacts as a full closed cycle cooling system, along with the impacts of once-through cooling.

6. Total cost of application of technology in relation to reduction in effluent

The total cost of the application of the technology needs to evaluate the costs of the benefits of the reduction in the effluent, the social benefits, the capital and construction costs, the costs in loss generation and electricity to sale, and the overall environmental impact. The overall environmental cost needs to include the cost of additional chemicals, impacts to waste streams being handled, and impacts to the air quality.

- Once-Through Cooling: This is the installed technology at the Labadie Energy Center.

- Cooling Pond: Space and Missouri River issues preclude this as a viable technology for the Labadie Energy Center.

- Cooling Towers: While the installation of closed cycle cooling would reduce the discharge of heat load into the water, it would increase the consumption of water, it would have high capital costs and entail the addition of new chemicals, and a new water treatment plant. The costs of these factors must be included to determine the total cost of a complete plant cooling system. The cost estimate by Pacific Gas and Electric for the Diablo Canyon Plant, an ocean-based facility of similar size to Labadie, would require $2.7 billion in capital and a 17 month outage to prepare the site for cooling towers in 2008. Also Pacific Gas estimated that paying for replacement power plus the capital expense for installation would be $4.5 billion to retrofit Diablo Canyon, a 2,240 MW plant. [9]

- Mechanical Chillers: Mechanical chillers operate with heat exchangers and pumps to control the temperature of the discharge. Corrosion protection chemicals would also be required. The installation of mechanical chillers would require energy to operate, still have the large withdrawal of water from the river, would transfer the heat from the water to the atmosphere, addition of concerns with clogging and flooding due the Missouri River's operation and flow.

- Helper Cooling Systems: Ameren previously estimated the cost of constructing a helper cooling tower at $112 million.[8] The construction of a helper cooling system would still impact aquatic life via the intake structure, discharge heated water , require retrofits to the existing system resulting in a loss of energy production, introduce additional chemicals to the process to prevent fouling and scaling, and put more heat into the atmosphere. At the Brayton Point Power Plant, which is 1500 MW plant, the construction cost estimate from 2002 was $98.9 million, with an estimated annual maintenance costs are $300,000 per year. In addition, the Brayton Point estimated combined lost annual generation to be 152,148 MW-hr/year. This consists of 112,875 MW-hr/yr off additional auxiliary power consumption and 39,275 MW-hr/yr of steam turbine operating penalties.[10]

7. Reasonableness of the cost of the application of technology and the removal of effluent

The cooling technologies are established technologies throughout the country; however the construction and establishment of the technology at the Labadie Energy Center requires a detailed engineering evaluation. The reasonableness of the application of the technology needs to account for the ability of the technology to be constructed and used on site and to produce a benefit of removing the parameter of concern (heat). The installation of the technology (or a mix thereof) must be reasonable, in that the solution is logical.

- Once-through cooling is the established and existing technology at the Labadie Energy Center. Once-through cooling has impacts on thermal discharge to the Missouri River and impacts on impingement and entrainment at the intake. While once-through cooling withdraws high volumes of Missouri River water, it returns nearly all of those withdrawals to the river.

- A cooling pond is not a reasonable alternative for the Labadie Energy Center as the location is not appropriate and the heat would still be discharged to the environment, just would be recirculated through the pond. Removal of additional farm land from productive use and changes in the flood controls in Franklin County would not be a supported alternative.

- Closed Cycle Cooling Towers are an established technology that may be feasible at the Labadie Energy Center. Siting conditions must be considered. The installation of closed cycle cooling may reduce the generating capacity of the facility by 4% or more. With closed cycle cooling, more water would be consumed in the process, a water treatment plant would need constructed to clean the water to the level for recirculating, and chemicals would be required to prevent fouling and scaling in the towers. Closed cycle cooling may require replacement of turbines and other equipment, plus changes in piping and handling methods of waste streams. Closed cycle cooling would also require changes in outages of power from once every three years currently to a more frequent for cleaning and maintenance. Closed cycle cooling would further increase the heat released to the atmosphere and a potential increase in greenhouse gases.

- Mechanical Chillers: Mechanical chillers operate with heat exchangers and pumps to control the temperature of the discharge. Corrosion protection chemicals would also be required. The installation of mechanical chillers would require energy to operate, still have the large withdrawal of water from the river, would transfer the heat from the water to the atmosphere, addition of concerns with clogging and flooding due the Missouri River's operation and flow. Concerns cited by the Carroll County, Maryland with using mechanical chillers include air pollution concerns, water quality such as usage of biocides, and noise pollution.[11]

- Helper Cooling Systems would have the impacts of both closed cycle cooling system and the once through system. While it would reduce the impact of heat into the Missouri River, it would still require the treatment at the water treatment plant, retrofitting of the system to handle at least partial flow through a cooling tower for recirculation. Additional chemicals to prevent fouling and scaling in the tower. Ameren estimates that it would $112 million to construct a helper cooling tower.[8] At Brayton Point, there was a high energy penalty with the installation of a helper cooling tower with the loss of annual generation of 152,148 MW-hr/year.[10]

As part of the renewal and the 316(b) requirements, changes to the intake structure are required and one option required for evaluation is the installation of closed cycle cooling.

8. Comparison of cost and level of reduction

- **Once-through cooling** is the existing technology in use. This is what Labadie Energy Center was constructed with and the cost is cost to continue operating and maintaining the system. The level of reduction is what the thermal studies of the 1970s set as the operating conditions is the level of reduction. Under the new 316(b) intake structure rule, the facility will face upgrades to reduce the number of aquatic larval and fish being impinged and entrained on the intake structure.

- **Closed Cycle Cooling Towers:** While the installation of closed cycle cooling would reduce the discharge of heat load into the water, it would increase the consumption of water, it would have high capital costs, addition of new chemicals, and a new water treatment plant. There are additional costs which must be included to determine the total cost of the wet cooling tower as part of a complete plant cooling system. The cost estimate by Pacific Gas and Electric for the Diablo Canyon Plant, which is similar size to Labadie required $2.7 billion in capital and a 17 month outage to prepare the site for cooling towers in 2008. Also Pacific Gas estimated that paying for replacement power plus the capital expense for installation would be $4.5 billion to retrofit Diablo Canyon, a 2,240 MW plant. [9] Retrofitting a facility that was originally designed for once-through cooling to a recirculating cooling system will result in reduced power output from the additional equipment that needs to be run, such as pumps and fans, and from the loss of efficiency because the cooling water is generally warmer coming back from a cooling tower than it is from the body of water used by a once-through cooling system. Accordingly, the energy penalty of retrofitting to a recirculating cooling system is the greatest when the power grid is strained the most, during periods of peak summer electric demand. The loss of efficiency and generation capacity means that less electricity is available to meet demand or to serve as reliable reserve capacity.[12]

- **Mechanical Chillers:** The City of Corvallis, Oregon estimated that the cost to install mechanical chillers for temperature compliance for 11 MGD would be $35.1 million in 2008.[13] Multiplying this cost to the 1438 MGD of Labadie's discharge, the cost would be $4.5 billion (1438MGD/11MGD*$35.1M). For a 500 MW combined cycle greenfield plant, the cost estimate was $445 million in 2003, so the cost at Labadie at a minimum would be $2.3 billion, if that was a greenfield site plus inflation, retrofitting the existing system and cost of service increases over the last 12 years($445M*5) .[14] The installation of mechanical chillers would require energy to operate, still have the large withdrawal of water from the river, would transfer the heat from the water to the atmosphere, addition of concerns with clogging and flooding due the Missouri River's operation and flow. Concerns cited by the Carroll County, Maryland with using mechanical chillers include air pollution concerns, water quality such as turbidity and usage of biocides, and noise pollution. [11]

- **Helper Cooling Systems:** Helper Cooling systems operate in combination of once-through cooling and the closed cycle cooling to reduce the overall heat load to the river. Ameren estimated the cost of constructing a helper cooling tower at $112 million.[8] The construction of a helper cooling tower will still have the impact to aquatic life on the intake structure with impingement and entrainment, it will still have water with elevated temperature being discharged, it will require retrofits to the existing system resulting in a loss of energy production, it will introduce additional chemicals to the process to prevent fouling and scaling, it will put more heat into the atmosphere. At the Brayton Point Power Plant, which is 1500 MW plant, the construction cost estimate from 2002 was $98.9 million, with an estimated annual maintenance costs are $300,000 per year. In addition, the Brayton Point estimated combined lost annual generation to be 152,148 MW-hr/year. This consists of 112,875 MW-hr/yr off additional auxiliary power consumption and 39,275 MW-hr/yr of steam turbine operating penalties.[10]

9. Cost of achieving effluent reduction

The costs associated with installation of closed cycle cooling at an existing facility that utilizes once through cooling are substantial. The most comprehensive evaluation of these costs has been completed by Maulbetsch Consulting in September 2010.[1] That report developed "*an estimate of the national cost of retrofitting with closed-cycle cooling systems all electric power plants which had been classified as "Phase II facilities" under Section 316(b) of the Clean Water Act.*"[2] While the impetus for the Maulbetsch report was an evaluation of technologies that might achieve compliance with Section 316(b) of the Clean Water Act (i.e., requirements governing the intake side of the power plant cooling water process), many of the findings of that report are equally applicable to evaluation of technologies that might achieve compliance with Section 316(a) of the Clean Water Act (i.e., requirements governing the discharge side of the power plant cooling water process), and are of consequence to the derivation of a Technology Based Effluent Limitation in this

[1] *Closed-Cycle Retrofitting Study: Capital and Performance Cost Estimates,* prepared by Maulbetsch Consulting for EPRI (Palo Alto, CA) et al., Final Report September 2010.
[2] Ibid., page 4.

instance. In its consideration of over 400 power plants (404 fossil plants and 40 nuclear plants), Maulbetsch found the following:

Plant Type	Capacity (MW)	Capital Cost (MM$)	Downtime Cost (MM$)	Total Capital + Downtime Cost (MM$)	Total Capital + Downtime Cost (MM$ per MW)
Nuclear	61,444	19,140	16,955	36,095	0.587
Fossil	265,592	46,020	14,316	60,336	0.227

Applying the lesser of the above cost estimates to the Labadie Energy Center (2,407 MW capacity) reveals that a capital plus downtime cost estimate in the range of $547,000,000 would be incurred due to the installation of a closed cycle cooling system. Of course, site specific conditions at Labadie may result in an actual cost that is greater than this. Maulbetsch further evaluated the net present value of the additional annual operating and penalty costs that would be incurred by a once through cooling facility retrofitted to install closed cycle cooling, and found the following:

Plant Type	Annual Operating Power (MM$)	Annual Heat Rate Penalty (MM$)	Net Present Value Annual + Initial Costs (MM$)	Net Present Value (MM$ per MW)
Nuclear	220	359	40,162	0.654
Fossil	449	158	64,600	0.243

Considering these annual costs in addition to the initial costs, results in a total net present value cost of $585,000,000 for the Labadie facility.

Ameren independently authorized completion of a preliminary assessment of the cost of installing closed loop cooling at the Labadie Energy Center.[3] That assessment found that installation of rectangular mechanical draft cooling towers would incur an estimated initial capital cost of approximately $397M. Installation of natural draft cooling towers was estimated to cost $456M. Note that these costs represent initial costs only and do not include plume abatement (to eliminate icing potential and aesthetic issues) associated with mechanical draft towers. Consequently, they are comparable to the Maulbetsch cost estimates cited above.

A cost estimate for installation of once through cooling has been prepared for the Merrimack Station Power Plant in Bow, New Hampshire by USEPA.[4] A total present value after tax cash cost of $111,800,000 was determined. The facility includes two electric generating units with nameplate ratings of 350 MW and 120 MW for a total of 470 MW,[5] and thus a cost of approximately $240,000 per MW. The Labadie facility has a capacity of approximately 5 times that of the Merrimack Station, and thus the prorated cost applied to Labadie would be approximately $574,000,000. Note the good agreement with the Labadie cost estimates based on the Maulbetsch study.

The above information suggests that the cost to install closed cycle cooling at the Labadie Energy Center would be in the range of a half billion dollars. It could certainly be more. For example, at the Millstone Power Station in Connecticut, the estimated capital cost to install natural draft cooling towers was estimated to be approximately two billion dollars plus additional annual operation and maintenance costs.[6] The Millstone facility has a total capacity of 2113 MW which is comparable to but slightly smaller than the Labadie Energy Facility. Also, as cited above, the cost to install closed cycle cooling at the Pacific Gas and Electric Diablo Canyon Plant (a 2240 MW facility) was estimated to exceed seven billion dollars.[7] Of course, Diablo Canyon is a nuclear powered facility and the Maulbetsch study has shown that costs at such facilities are estimated to be approximately two and a half times those at fossil fuel powered facilities. Nonetheless,

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[3] Correspondence from CB&I to Ameren Missouri, October 2015.

[4] *EPA – New England Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire, NPDES Permit No. NH0001465*, Attachment D to 2011 Fact Sheet for Draft NPDES permit, prepared by USEPA New England Region I, September 27, 2011.

[5] The document also cites that the facility has "*an electrical output of approximately 478 megawatts ("MW").*"

[6] *Comprehensive Evaluation of Cooling Water System Alternatives at Millstone Power Station (MPS) Final Report*, Project No. 19998242.10400, prepared by URS, August 2012.

[7] Site preparation cost of $2.7 billion, installation + power replacement cost of $4.5 billion, plus outage costs.

correcting for such would still give a cost estimate of about two and a half billion dollars for an equivalent fossil fuel powered facility.

The above cost estimates provide for complete replacement of the once through cooling system at the Labadie Energy Center. As discussed further above, one alternative to reduce the thermal load to the Missouri River from the Labadie facility is to install "helper" cooling towers that don't eliminate the heated discharge, but rather reduce its temperature before discharge. However, these costs are not insignificant either and approach those of complete replacement of once through cooling. As cited previously, Ameren has estimated that such a system would cost approximately $112,000,000 per unit at Labadie. This is verified with information for the Brayton Point Station power plant in Somerset, Massachusetts (see previous citation) where the helper cooling tower construction cost has been estimated at $98,900,000 for a 1,500 MW facility, compared to $112,000,000 for the 2,407 MW Labadie facility. Additional costs including lost power generation would have to be added to these estimates. Thus, significant expenditures would need to be incurred for possibly marginal benefit in terms of temperature reduction of the discharge.

The cost to install mechanical chillers at the Labadie Energy Facility would be even greater than those for the installation of closed loop cooling. As cited previously, that cost is estimated to be several billion dollars.

Conclusion:

The Ameren Labadie Energy Center has been in operation for 45 years. The plant was constructed as and continues to operate as a once-through cooling system. In evaluation of the other technologies available , there are technically feasible options available that will reduce the discharge of heat to the Missouri River; however those options increase the chemicals in the discharge, release the heat to the atmosphere, and provide operational and maintenance issues. With the requirements under 316(b) to evaluate closed cycle cooling to address impingement and entrainment, the removal of the thermal discharge will also be evaluated.

After applying factors listed above, and considering the technologies and unique circumstances discussed above, the department has determined, based its best professional judgment, that once-through cooling system is the best available technology at this time. The Department of Natural Resources in evaluation of the requirements of 316(a) does not believe the case has been made for the continuation of the 316(a) Variance originally granted in 1977 and as such requires Ameren to conduct biological monitoring upstream and downstream of the intake and discharge. The permit requires Ameren be in compliance with the Department's Water Quality Standard of 90°F by July 31, 2025.

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